Dissertation

The Impact of Leadership Skills, Social Pressure and Sabotage Behavior on Individual Income and the Performance of Teams

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Vorwort

Dass es die Möglichkeit geben würde, sich im Rahmen einer Doktorarbeit unter anderem mit der Entlohnung von professionellen Basketballspielern zu beschäftigen, wirkt für mich selbst nach Beendigung der Arbeit surreal. Auch wenn inhaltlich spannende Forschungsfragen vieles erleichterten, wäre deren Bearbeitung ohne die vielfältige Unterstützung verschiedener Personen nicht möglich gewesen. Ein besonderer Dank gilt an dieser Stelle denjenigen, die mich maßgeblich bei der Erstellung unterstützt haben:

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1 Introduction

Ever since the development of modern human capital theory by Becker (1962, 1964), Mincer (1958, 1974) and Schulz (1961) countless studies have tried to explain what impacts individuals' salary. Most of them rely on the enclosure of traditional human capital predictors like workers tenure, education and social background and are able to explain a sizeable amount of salary differences. Only recently, studies have started to include personality traits into the salary determination, even though it is common knowledge that cognition and personality are related to labor market participation, as stated by Heineck and Anger (2009). This lack of empirical evidence has earlier been mentioned by Bowles, Gintis and Osborne (2001a). In their opinion, the scarcity of corresponding research is mainly based on the fact that economic theory simply does not predict which personality traits influence earnings. Additionally, the authors suggest a dependency between the job in itself and the influence of certain personality traits. They claim that the desired personality is subject to the according job, as for example the personality requirements for a salesperson differ vastly from those for a police officer. Lee (2006) supports this view, as in his opinion jobs themselves hold demand on personality traits, which leads to personality being rewarded differently in different workplace situations. Having mentioned these specifics of evaluation, the question remains in which way personality influences salary - given individuals' human capital, cognitive ability and job performance. The main goal of the following research is to explain prior unexplained components of salary by personality traits - a task given twenty years ago by Earl (1990). In order to be able to relate the following work to previous studies, a short overview of the already existing literature appears to be appropriate.[1]

Recent research focuses on the impact of personality traits on individuals' salary as they describe the individual's emotional, interpersonal, experimental, attitudinal and motivational styles. To classify personality traits into categories, the so-called big five factors of personality, also known as the Five Factor Model, have been introduced by Digman

[1] Exploring the impact of personality on salary may also help to explain salary discrimination against woman. Men and woman rather work in certain jobs, which reward or punish sets of personality traits differently. For studies on this subject see Filer (1981), Nyhus and Pons (2005) and Fietze, Holst and Tobsch (2009).

(1990). Namely they are referred to "extraversion", "agreeableness", "conscientiousness", "emotional stability" and "autonomy".[2] Increasing consensus developed during the last years on these five personality factors, as reported by Nyhus and Pons (2005). In order to collect evaluation data about ones personality traits, which are typically self-reported, studies refer to test procedures like the five-factor inventory developed by Hendriks, Hofstee, De Raad und Angleitner (1999). This query contains 20 statements for each of the five personality traits, of which half are phrased positively and half are phrased negatively, as respondents select answers out of five-level Likert scales. The Five Factor Model helps to understand the relationship between personality and job criteria, as certain personality traits appear to be valid predictors of job performance. Studies usually control for job occupation, since different jobs set unique requirements to employees. In addition, cultural differences lead to varying exigencies on employees, as pointed out by Schmidt, Ones and Hunter (1992). To understand the denotation of the five previously named categories, a short explanation follows for each of them, all relating to the definitions provided by Nyhus and Pons (2004).

- Extraversion is related to ones preference for human contact, attention and the wish to inspire people. It describes people's gregariousness and assertiveness to illustrate how outgoing people are.
- Agreeableness describes to which degree people are willing to help others and cooperate with them. It furthermore shows how individuals act consistent to others peoples interest.
- Conscientiousness displays the preference for following rules and schedules, working hard and being organized.
- Emotional stability shows if people are self-confident, calm and cool.
- Autonomy illustrates individuals' penchant to make one's own decisions. Besides it describes to which degree an individual takes initiative and control.

Summing up results of previous research, there is to mention that results vary considerably across studies, rarely exhibiting constant results concerning the impact of the

[2] Other studies show minor differences in the category labels with basically the same meaning. See for example Costa and McCrea (1985, 1992), who determine the categories of personality traits as "extraversion", "agreeableness", "conscientiousness", "neuroticism" and "openness to experience".

described personality traits on salary. Meta-studies by Salgado (1997) for Europe as well as by Barrick and Mount (1991) and Tett, Jackson and Rothstein (1991) for North America find a coincident result in a way that conscientiousness is the only personality trait which serves as a valid predictor of job performance in all three analyses. A more recent study by Bondreau, Boswell and Judge (1999) which analyzes career success of executives in North America and Europe, supports this finding. All other personality traits prove to be valid predictors for only some job criteria and some occupational groups. Problematic in this regard might the broad range of jobs included as well as the self-reported evaluations of the respondents, which are nearly impossible to verify if being correct. To account for these problems the following work concentrates on clearly identified markets and includes objective and measurable indicators for individuals' personality.

In contrast to research on the influence of personality on salary, research that deals with the development of personality traits throughout the life course offers coincident results. Literature shows consensus that personality is developed at young age and remains very stable throughout life.[3] Costa and McCrae (1988, 1994, 1997) claim that personality remains consistent and if it actually does change, it changes at a very slow pace. They suggest that personality traits stop changing at the age of 30, a finding which is supported in a further study by Brandstätter (1999). Nevertheless, it should be considered that interaction with others as well as the surroundings of an individual lead to, even though small, changes of personality over time. In this context, Srivastave, John, Gosling and Potter (2003) show that an individual's social and job environment affects personality traits in early and middle adulthood, a finding which is also pointed out by Borghans, Duckworth, Heckman and Ter Weel (2008).[4] Using the German Socio-Economic Panel, Flossmann, Piatek, Wichert and August (2007) examine the role of personality traits for labor market success. Their findings suggest that personality matters even when controlling for different aspects such as education and professional experience. They conclude that labor market success is influenced by early childhood since

[3] Jang, Livesley and Vernon (1996) show positive correlations of personality traits between generations, as their finding support the theory that they are heritable.

[4] In line with this result, Caspi (1998) mentions that interaction between individuals affects personality over time.

the formation of personality occurs during the first years of life under the influence of the parents and the educational system.

To empirically test the following research questions, which mainly address the influence of personality on earnings, I use different data sets from professional sports, especially from the National Basketball Association, the National Hockey League and the German Bundesliga, whose characteristics are being described in detail in the respective chapters. Next to providing detailed information on individuals' performance and salary, the team sports industry itself is an expanding market with team values growing on a yearly basis and reaching considerable magnitudes. Especially for the US team sports industry information about team values is very well kept by Forbes Magazine.[5] For the leagues considered in this work, the National Basketball Association displays the highest average team value with 367.0 million US-Dollars for the league consisting of 30 teams. Team values in the National Hockey League are comparably lower, as the league which also consists of 30 teams exhibits an average team value of 222.6 million US-Dollars. For the German Bundesliga which is 18 teams strong, individual team values are only reported for the six most valuable teams. One observes team values to be way less equally distributed across the teams as Bayern Munich is the most valuable team with 1.11 billion US-Dollars, while the sixth most valuable team is VfB Stuttgart with 264 million US-Dollars.[6] As teams generate increasing revenues, individual player salaries also rise. Data on this is provided in the following chapters, also including information on salary history. As one can see, from an economic standpoint professional sports surely display an industry analyzing worthwhile.

The next two chapters of the following work deal with a personality trait which some individuals are asked to show in team sports as well as in other group productions. Of the five personality traits presented above, leadership skills are best fitting with extraversion, as Heineck and Anger (2009) state that extraverts show a higher probability of

[5] Yearly information on team values is provided on the magazines official website at http://www.forbes.com/business/sportsmoney. All following information is from the year 2009.

[6] The Los Angeles Lakers are the most valuable team in the National Basketball Association with 607 million US-Dollars, while the Toronto Maple Leafs is the most valuable team in the National Hockey League with 470 million US-Dollars.

taking leadership roles.[7] Leadership skills are assumed to be compensated monetarily, nevertheless there is a lack of empirical evidence for this common thesis. Since in professional sports the team captains are expected to possess these leadership skills, the next two chapters will explore the impact of this ability on salary. The second chapter is a joint work with Bernd Frick about the monetary impact of leadership skills in professional soccer. Using data of 13 consecutive seasons from the German Bundesliga, we show that team captains receive a wage premium between 25 and 67 percent, dependent on the model specification.[8] In chapter three a similar research question is applied, this time using data of four years from the National Hockey League. Again controlling for individual player characteristics and performance indicators I show that leadership ability is rewarded pecuniary by a premium between 21 and 35 percent.[9]

Following in chapter four I turn to an analysis on the returns to mental toughness in professional basketball and present a joint work with Bernd Frick and Joachim Prinz. We classify mental toughness to the personality trait of emotional stability, as it depicts individuals' self-confidence and tendency to be calm. Since many team sporting events are decided during the last seconds of the game, the question arises if players, who are able to maintain their performance during crucial game situations, are rewarded pecuniary. While looking at the performance of players from the National Basketball Association for a time period of four consecutive years our data suggests that individuals get monetarily rewarded for exhibiting mental toughness. Furthermore, we show that experience does not improve the ability to maintain the individual performance level during crucial game situations. This implies that mental toughness is a congenital skill, a result which goes in line with the mentioned findings that personality traits stay consistent throughout a lifespan.

[7] The relationship between conscientiousness and leadership, which is of highly interest in the work to follow, is unclear. Tagger, Hackett and Saha (1999) find that leadership is most strongly associated with cognitive ability, followed by the personality trait conscientiousness. By contrast, Judge and Bono (2000) find conscientiousness to be unrelated to leadership, as they relate the five traits to transformational leadership. For a survey article concerning different approaches to relate personality to effectiveness see Andersen (2006).

[8] Chapter two is the only one written in German. For the sake of clarity, I retain English chapter headings and legends.

[9] Based on this chapter the article "The Payoff to Leadership in Teams", has been published in the Journal of Sports Economics (Deutscher (2009)).

Chapter five is closely related as it analyses the influence of the audience on the performance from the free throw line in professional basketball. I distinguish between the performance in friendly and hostile environments as in home and away games. Since past research neglects the impact of a change of the audience, professional sports appear to be a fitting natural experiment as players change teams between seasons to face a new home crowd after a team switch. The results show that players who sign a contract with a new team show comparably worse performance in front of the new supportive audience compared to players who either do not change teams or get traded to a new team. I conclude that signing with a new team during the offseason puts additional pressure on the player during home games in the following season, while it does not impact performance during away games. Performing quantile regressions shows that especially bad free throw shooters performance suffers from signing with a new team.

For the last three chapters I broaden my focus to other fields of research. Chapter six is concerned with the impact of the implementation of cut-off dates on success in professional German soccer. Cut-off dates lead to groupings of children with regard to their birthdays. Especially at young age this leads to big differences in relative age between members of the same cohort, which in turn might lead to a selection bias. Older children of the cohort might be labeled as being more talented, simply due to their physical advantage over their younger counterparts. This actually causes an overrepresentation of German players who were born shortly after the cut-off date in the Bundesliga for a sample of 13 seasons. Prior studies find a wage premium for young players who make it to the professional level despite their age disadvantage. I also analyze this for my data set to find no support for this result, as the birth date does not affect the income. This makes sense in the way that only performance enhancing factors should result in a wage premium and the birth date itself should not impact the performance. In addition, hazard rates for players should be independent of the date of birth as, again, the birth date should not impact players' performance. For the aforementioned data set on the Bundesliga this claim is supported.

Following in chapter seven is a joint work with Bernd Frick, Oliver Gürtler and Joachim Prinz. We address the problem of sabotage in tournaments, when contestants are heterogeneous in ability. Our theoretical model states that favorites exert higher legal effort while underdogs are more tempted to engage in sabotage actions, since favorites are assumed to be more productive with respect to legal effort and both types of effort are substitutes. In a second step, we use data from German professional soccer to test this prediction empirically. In line with the theoretical model, we find that favorite teams win more tackles in a fair way, while underdog teams commit more fouls.[10]

In chapter eight I once again broaden my focus to another field of research, as the chapter provides insights on the economics of the FIFA World Cup, which is the most-viewed sporting event on earth and generates billions in revenues. In a joint work with Rob Simmons we present a general review of the literature on financial impact of the World Cup for the hosting country. We provide an extension to the existing literature by analyzing the remuneration of participating in the World Cup as a player. Using data from the German Bundesliga we find support for a World Cup shop window effect. Participating in the World Cup raises players' salary and increases their chance to move to stronger teams within Europe. Finally, chapter nine concludes the dissertation by summarizing the results and providing a short outlook for ulterior research.

[10] Based on this chapter the article "Sabotage in Heterogeneous Tournaments: A Field Study", has been sent to the Journal of Institutional and Theoretical Economy (status: revise and resubmit).

2 Rewarding Leadership Skills in Professional Team Sports – Empirical Evidence from the German Bundesliga

2.1 Introduction

Unabhängig davon, ob man nationale Ligaspiele oder internationale Ländervergleiche von Sportmannschaften betrachtet: Immer wieder fordern sowohl Trainer, als auch Medien von den beteiligten Mannschaftskapitänen Führungsqualitäten unter Beweis zu stellen. Unklar ist bislang, inwieweit diese Führungsqualitäten, welche die Kapitäne vorweisen sollten, unter Berücksichtigung weiterer individueller Charakteristika sowie beobachtbarer Leistungsdaten, zu einem höheren Lohn für die jeweiligen Spieler, welche mit den Kapitänsaufgaben betraut werden, führen.

Die bestehende Literatur analysiert zumeist die Entlohnung von Führungsqualitäten auf Managementebene in Unternehmen. Diese Führungsqualitäten werden im Allgemeinen als "soft skill" angesehen, deren Bedeutung bei der Rekrutierung von Personal immer weiter an Bedeutung gewinnt.[11] In ihrer, die bestehende Literatur prägenden, Arbeit gehen Kuhn und Weinberger (2005) der Frage nach, inwieweit die Übernahme von Positionen als Kapitän einer Schulsportmannschaft oder als Präsident einer schulischen Organisation Einfluss auf die spätere Gehaltshöhe nimmt. Die beiden Autoren argumentieren hierbei, dass die Übernahme dieser Positionen für den späteren Karriereverlauf relevante Führungsqualitäten fördert. Die der Arbeit zugrunde liegenden Datensätze lassen die Autoren zu dem Ergebnis kommen das Männer, welche eine der beiden oben genannten Positionen während ihrer Schulzeit besetzen, eine Dekade später im Durchschnitt ein zwischen 4 und 24 Prozent höheres Gehalt beziehen. Eine Reihe weiterer Publikationen beschäftigen sich mit dem Einkommenseffekt der Partizipation an außerschulischen Aktivitäten. So zeigen Barron, Ewing und Waddell (2000), dass Schüler, die am Sportprogramm ihrer High-Schools teilnehmen, im Beruf ein zwischen 4 und 15 Prozent höheres Gehalt beziehen als Schüler, die an anderen schulisch organisierten Freizeitgestaltungen teilnehmen. In ihrer empirischen Untersuchung zeigen Cornelißen und Pfeifer (2007) für deutsche Schüler einen signifikant positiven Zusammenhang

[11] Vergleiche Moss und Tilly (2001).

zwischen der Partizipation an außerschulischen Sportaktivitäten und dem höchsten erreichten Bildungsabschluss.

Unter Berücksichtigung dieser Erkenntnisse ergibt sich die Frage, welche Einflussfaktoren für die Entwicklung von Führungscharakteren von Bedeutung sind. Die Literatur bietet eine Reihe von Arbeiten, welche die Fähigkeit, Führungsrollen zu übernehmen mit dem Alter von Individuen zu Beginn ihrer schulischen Laufbahn in Verbindung bringen. Sie argumentieren in ähnlicher Weise, dass in Bundesstaaten, in denen ein Stichtag für die Einschulung von Kindern besteht, der relative Altersunterschied zwischen den Ältesten und den Jüngsten in der Klasse bis zu zwanzig Prozent beträgt. Auf diese Feststellung aufbauend formulieren sie die Hypothese, dass diejenigen Kinder, die kurz nach dem Stichtag Geburtstag haben aufgrund ihrer fortgeschrittenen physischen und geistigen Entwicklung die Führung im Klassenverband übernehmen. Diese Führungsqualitäten bleiben aufgrund der Erfahrung auf der Führungsposition auch in späteren Jahren erhalten. Dhuey und Lipscomb (2008) zeigen, dass Schüler aus dem ältesten Quantil eines Jahrgangs mit vier bis elf Prozent höherer Wahrscheinlichkeit die Position als Mannschaftskapitän im Sport übernehmen als die jüngsten Schüler eines Jahrgangs. Auch in der Selbsteinschätzung bezüglich Führungsqualitäten weisen ältere Schüler signifikant höhere Werte auf. Allen und Barnsley (1993) kommen bei ihren Untersuchungen von schulischen Leistungen sowohl in Kanada, wie auch in Großbritannien zu vergleichbaren Ergebnissen: Die ältesten Schüler eines Jahrgangs gehören mit signifikant höherer Wahrscheinlichkeit zu den Besten.[12] Zudem zeigen die Autoren, dass in kanadischen Eishockeyligen Spieler aus dem ältesten Quantil eines Jahrgangs bis zu viermal mehr vertreten sind als Spieler, die zu den Jüngsten des Jahrgangs gehören. Im Bezug auf die Fußballbundesliga unterscheiden Ashworth und Heyndels (2007) in ihrer Untersuchung der Bundesligagehälter von zwei Saisons zwischen zwei verschiedenen diskriminierenden Effekten des Geburtsdatums von Spielern: Zum einen ermitteln sie eine Diskriminierung von Spielern, welche in großem Abstand zum Stichtag (1. August) für die Zuordnung von Jugendlichen in eine Altersklasse geboren wur-

[12] Bedard und Dhuey (2006) kommen in ihrer Untersuchung verschiedener OECD-Länder ebenfalls zu der Erkenntnis, dass die Jahrgangältesten bessere schulische Leistungen vorweisen als die jüngeren Mitschüler. Obwohl der relative Altersunterschied mit zunehmendem Alter geringer wird, beobachten die Autoren einen persistenten Leistungsunterschied.

den. Diese werden im Jugendalter „übersehen“ und sind folglich in der Bundesliga unterrepräsentiert. Des Weiteren kommen die Autoren zu der Erkenntnis, dass Spieler, die trotz ihres Altersnachteils die Fußballbundesliga erreichen, höher entlohnt werden.[13]

Während die Literatur also belegen kann, dass Individuen in der Wirtschaft für ihre Führungsqualitäten entlohnt werden und zudem Erklärungsansätze für die unterschiedliche Ausprägung dieser Fähigkeit liefert, herrscht bisher noch keine Erkenntnis darüber, inwieweit Führungsqualitäten im professionellen Mannschaftssport zu einem höheren Gehalt führen. Die vorliegende Arbeit geht dieser Fragestellung anhand der deutschen Fußballbundesliga nach. Gerade vom Kapitän wird gefordert, seine Mannschaft zu führen und als “rechte Hand“ des Trainers zu agieren. Unsere Haupthypothese lautet demnach, dass von Knappheit der Führungspersönlichkeiten auf dem „Arbeitsmarkt Bundesliga“ die Kapitäne zusätzlich monetär vergütet werden. Wir gehen nun mit Hilfe eines Datensatzes von 13 Saisons der ersten deutschen Bundesliga der Frage nach, inwieweit diese Führungsrolle monetär entlohnt wird. Es zeigt sich das, für individuelle Performance und Spielermerkmale kontrollierend, der Kapitän für seine Führungsqualitäten mit einem Lohnaufschlag zwischen 25 und 66 Prozent vergütet wird.

Die vorliegende Arbeit ist wie folgt aufgebaut: Im nächsten Abschnitt wird der Datensatz systematisch dargestellt. Im dritten Abschnitt werden die Modellschätzungen präsentiert, während im vierten Abschnitt abschließend die Befunde unserer Untersuchung diskutiert und mögliche Erweiterungen unserer Arbeit angesprochen werden.

2.2 Data Set and Descriptive Statistics

Die zentrale Fragestellung, der folgend nachgegangen wird, ist, ob und inwieweit die Führungsposition des Mannschaftskapitäns zusätzlich monetär entlohnt wird. Zwecks dieser Untersuchung verwenden wir einen Datensatz der deutschen ersten Fußballbundesliga. Dieser umfasst Leistungsdaten sowie individuelle Charakteristika der Bundesligaspieler aus den Saisons 1995/96 bis 2007/08 und umfasst 1993 verschiedene

[13] Eine eigene Untersuchung zu diesem Thema findet sich im sechsten Kapitel der vorliegenden Arbeit.

Spieler und eine Gesamtzahl von 6147 Spieler-Jahresbeobachtungen. Die Leistungsdaten der Bundesligaspieler wurden aus den jährlichen Sonderausgaben des Sportmagazins „Kicker“ entnommen, während Informationen bezüglich der Mannschaftskapitäne aus Artikeln des zweimal wöchentlich erscheinenden „Kicker- Sportmagazins“ zusammengetragen wurden. Nachfolgend wird derjenige als Kapitän einer Mannschaft betrachtet, der zu Beginn einer jeweiligen Saison dieses Amt übertragen bekommt. Bei einem Beobachtungszeitraum von 13 Saisons und einer konstanten Anzahl von 18 Vereinen ergibt sich somit eine Gesamtzahl von 234 Kapitänsjahren. Wie bereits angesprochen, wird vom Kapitän, welcher durch das Tragen einer Oberarmbinde optisch von seinen Mitspielern zu unterscheiden ist, die Übernahme von Führungsausgaben erwartet. Während ihm aufgrund seiner Position nicht mehr Rechte zustehen, so ist er dennoch mit mehr Pflichten betreut. So obliegt ihm beispielsweise die Pflicht, als Ansprechpartner des Schiedsrichters eventuelles Fehlverhalten seiner Mannschaft abzustellen. Im Beobachtungszeitraum waren 123 verschiedene Spieler Kapitän einer Mannschaft, was einer durchschnittlichen Amtsdauer von 1,90 Saisons entspricht. Hierbei ist eine rechtsschiefe Verteilung der Amtsdauer zu beobachten, da 70 Kapitäne ihr Amt für lediglich eine Saison ausübten. Mit Stefan Effenberg gibt es auch einen Spieler in der Bundesliga, der im relevanten Zeitraum bei zwei verschiedenen Vereinen Kapitän war, und zwar bei Borussia Mönchengladbach und bei Bayern München. Insgesamt können 14 Spieler eine Amtsdauer von mehr als drei Saisons verzeichnen, wobei es keine „Mindestzugehörigkeit“ zum Verein zu scheinen gibt. Alle diese Spieler können zum Zeitpunkt ihrer Berufung jedoch eine Mindesterfahrung von vier Saisons im deutschen Profifußball aufweisen. Eine Übersicht der Kapitäne mit den längsten Amtsdauern im Beobachtungszeitraum bietet Table 2-1.

Name	Verein	Kapitän ab	Jahre Kapitän	Jahre im Verein bei Erstberufung	Profisaisons bei Erstberufung
Frank Baumann	Werder Bremen	1999	8	1	2
Jens Nowotny	Bayer Leverkusen	1996	8	0	5
Oliver Kahn	Bayern München	2001	7	7	13
Stefan Reuter	Borussia Dortmund	1997	6	5	13
Zvonimir Soldo	VFB Stuttgart	2000	6	4	4
Tomasz Waldoch	Schalke 04	1999	5	0	5
Dariusz Wosz	VFL Bochum	2002	5	1	12
Arne Friedrich	Hertha BSC Berlin	2004	4	2	5
Marco Kurz	1860 München	1998	4	0	9
Altin Lala	Hannover 96	2003	4	5	5
Michael Preetz	Hertha BSC Berlin	1998	4	2	12
Olaf Thon	Schalke 04	1995	4	1	12
Thorsten Wohlert	MSV Duisburg	1996	4	3	9
Christian Wörns	Borussia Dortmund	2004	4	5	15

Table 2-1: Captains in the German Bundesliga with Three or more Seasons of Experience

Neben der, für die vorliegende Untersuchung entscheidenden, Variablen des Kapitänsamtes hängen die Spielergehälter erwartungsgemäß auch von einer Reihe weiterer Einflussfaktoren und Spielercharakteristika ab (siehe Table 2-2). Im Hinblick auf die Humankapitaltheorie wird im Folgenden zwischen drei verschiedenen Spielermerkmalen unterschieden, welche eine Differenzierung hinsichtlich der Erfahrung der Individuen ermöglichen. Zunächst bildet das Alter der Spieler zu Saisonbeginn einen Indikator für die Erfahrung. Zu erwarten sind - neben dem positiven Einfluss von dem Alter auf das Gehalt – negative Grenzerträge des Alters aufgrund nachlassender Leistungsfähigkeit. Aus diesem Grund wird auch das quadrierte Alter der Individuen ermittelt und der Einfluss auf das Spielergehalt untersucht.

Als zwei weitere Indikatoren von Erfahrung werden zudem die vor Saisonbeginn absolvierten Spiele in der ersten Fußballbundesliga, sowie die A-Länderspiele für das jeweilige Herkunftsland der Spieler betrachtet.[14] Die Unterscheidung ist bedeutsam, da sie

[14] Vergleiche Lucifora und Simmons (2003), sowie Frick (2007b).

eine Differenzierung zwischen nationaler und internationaler Erfahrung ermöglicht. Analog zu dem Alter-Gehalts-Profil sind auch hier jeweils umgekehrt U-förmige Verläufe des Bundesligaspiel-Gehalts-Profils und des Länderspiel-Gehalts-Profils zu erwarten.

Neben diesen, die Erfahrung eines Spielers abbildenden, Variablen wird mit den in der Bundesliga erzielten Toren auch eine bedeutende Leistungsvariable berücksichtigt. Hierbei sind die während der bisherigen Karriere erzielten Bundesligatore als Indikator für die Offensivfähigkeiten der Spieler zu sehen. Da die in einem Spiel erzielten Tore letztendlich den Ausgang des Spiels bestimmen, würde man einen positiven Einfluss der individuell erzielten Tore in der ersten Fußballbundesliga auf das Spielergehalt erwarten. Nicht unerwähnt bleiben sollte der Fakt, dass Tore vorwiegend von Stürmern und Mittelfeldspielern erzielt werden.

Abgesehen von den obigen Erfahrungs- und Leistungsdaten kann auch die Spielerposition, auf der die Spieler eingesetzt werden, Einfluss auf die Gehaltshöhe nehmen. Daher wird zwischen den Positionen Torwart, Abwehr, Mittelfeld und Sturm unterschieden. Jede dieser Positionen stellt spezifische Anforderungen an die Bundesligaspieler und ein Wechsel zwischen verschiedenen Positionen innerhalb der Karriere ist daher unüblich. Ein Wechsel von oder auf die Torwartposition war nicht zu beobachten; bedingt durch das sich stark unterscheidende Anforderungsprofil an diese Position. In dem untersuchten Zeitraum wechselten 241 Feldspieler die Positionen. Auf den Einfluss von höherer Flexibilität auf das Spielergehalt wird zu einem späteren Zeitpunkt einzugegangen.

Variable	Operationalisierung	Mean	Min.	Max.
Alter	Alter zu Saisonbeginn	26,39	17	41
Alter²	Quadriertes Alter zu Saisonbeginn	714,75	289	1681
BLS	Bundesligaspiele vor Saisonbeginn	55,81	0	540
BLS²	Quadrierte Bundesligaspiele vor Saisonbeginn	9611,22	0	291600
GP INT	Länderspiele vor Saisonbeginn	7,54	0	130
GP INT²	Quadrierte Länderspiele vor Saisonbeginn	331,00	0	16900
Tore	Bundesligatore vor Saisonbeginn	6,34	0	171
Torwart	Torwart (Dummy; 1 = ja)	0,11	0	1
Abwehr	Abwehrspieler (Dummy; 1 = ja)	0,28	0	1
Mittelfeld	Mittelfeldspieler (Dummy; 1 = ja)	0,39	0	1
Position	Spieler wechselte im Karriereverlauf die Position			
Sturm	Stürmer (Dummy; 1 = ja)	0,22	0	1
Kapitän (t)	Spieler in der aktuellen Saison Kapitän (Dummy; 1 =ja)	0,04	0	1
Kapitän (t-1)	Spieler in der letzen Saison Kapitän (Dummy; 1 =ja)	0,03	0	1
Deutschland	Spieler ist deutscher Nationalität (Dummy; 1 =ja)	0,58	0	1
Südamerika	Spieler stammt aus Südamerika (Dummy; 1 =ja)	0,05	0	1
Nordamerika	Spieler stammt aus Nordamerika (Dummy; 1 =ja)	0,01	0	1
Osteuropa	Spieler stammt aus Osteuropa (Dummy; 1 =ja)	0,16	0	1
Westeuropa	Spieler stammt aus Westeuropa (Dummy; 1 =ja)	0,13	0	1
Afrika	Spieler stammt aus Afrika (Dummy; 1 =ja)	0,05	0	1
Asien/Austr.	Spieler stammt aus Asien/Australien (Dummy; 1 =ja)	0,02	0	1

Table 2-2: Descriptive Statistics

Die abhängige Variable der vorliegenden Untersuchung, das individuelle Spielergehalt, wird über die Marktwerte der Bundesligaspieler aus dem „Kicker Managerspiel“ approximiert. Bei diesem Managerspiel weist das Magazin jedem Spieler vor Beginn der Bundesligasaison einen Marktwert zu. Die Nutzer des Spiels stehen vor der Aufgabe unter gegebener Budgetrestriktion aus dem Pool aller Bundesligaspieler eine möglichst gute Mannschaft zusammenzustellen, wobei die erreichte Punktzahl der eigenen Mannschaft von der Leistung der gewählten Spieler in der Fußballbundesliga abhängt. Das approximierte Spielergehalt in der Saison t ermittelt sich wie folgt:

$$Spielergehalt\ (t) = \frac{Kicker\ Marktwert\ (t)}{1{,}5}$$

Es zeigt sich, im Abgleich mit den Informationen aus den Lizensierungsverfahren des Deutschen Fußball Bundes beziehungsweise der Deutschen Fußball Liga, dass diese Approximation hoch mit den öffentlich bekannten Gehältern korreliert und die durchschnittlichen Gehaltsaufwendungen der Bundesligisten gut abbildet. Nach der Darstellung des der Regressionsanalyse zugrunde liegenden Datensatzes gilt es, im Rahmen der folgenden Untersuchung der monetären Entlohnung des Kapitänsamtes nachzugehen.

2.3 Empirical Results

Zunächst einmal wird auf die Verteilung der Gehälter in der ersten Fußballbundesliga eingegangen, bevor die Einflussnahme der Kapitänsrolle auf das Spielergehalt analysiert wird. Bei einer Gehaltsspanne zwischen 17.043 und 10.000.000 Euro pro Spielzeit ist eine rechtsschiefe Verteilung der Gehälter zu beobachten (siehe Figure 2-1). Während das Durchschnittsgehalt pro Saison bei 909.014 Euro liegt, lässt sich ein Mediangehalt von 666.667 Euro ermitteln. Diese Einkommensverteilung lässt sich mittels Rosens (1981, 1983) „Theorie der Superstars“ erklären, nach der schon geringe Talentunterschiede zu erheblichen Einkommensunterschieden führen.[15]

[15] In ihrer Untersuchung zeigen Lehmann und Schulze (2008), dass die Medienpräsenz von deutschen Fußballprofis einem statistisch signifikant positiven Einfluss auf Spielerhälter nimmt, allerdings mit abnehmendem Grenznutzen. Es scheint schwer, dieses Ergebnis mit der “Theorie der Superstars” von Rosen in Einklang zu bringen.

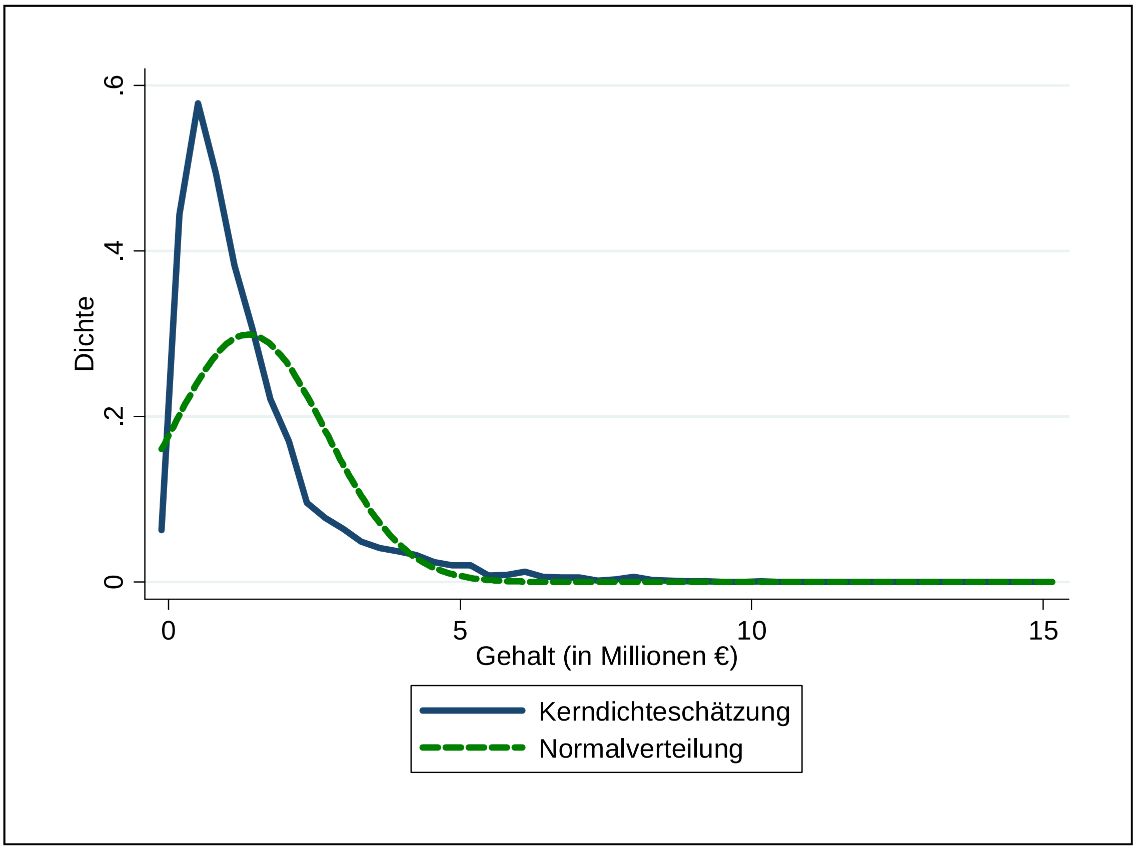

Figure 2-1: Kernel Density Estimation of the Salary in the German Bundesliga

Nach dieser sehr allgemeinen Analyse der Verteilung der Spielergehälter werden nun die vermuteten Einkommensdeterminanten der individuellen Spielergehälter untersucht. Mit Hilfe verschiedener Regressionsverfahren wird hierfür im Folgenden versucht, die Varianz der Gehälter zu erklären. Ziel des Hauptteils der vorliegenden Untersuchung ist es der Frage nachzugehen, welchen pekuniären Einfluss die Führungsqualitäten der Bundesligafußballer, abgebildet durch das Besetzen des Kapitänsamtes, haben. Dies erfolgt durch eine Schätzung der Einkommensfunktion nach Mincer (1974). Aufgrund des Panelcharakters der vorliegenden Daten führen wir neben der OLS-Schätzung auch eine Random Effects-Schätzung durch, welche die Inkludierung von zeitunabhängigen Variablen erlaubt. Zudem berücksichtigt letztere Schätzung, dass die gegebenen individuellen Effekte auch auf einer Vielzahl zusätzlicher, nicht beobachtbarer oder zufälliger Variablen beruhen können.[16] Die Verwendung von einer Fixed Effects-Schätzung

[16] Vergleiche Mátyás und Sevestre (1996, S. 94).

scheint im vorliegenden Kontext wenig angebracht, da beispielsweise die erklärenden Variablen der regionalen Herkunft zeitinvariant sind.[17]

Unter der Annahme, dass sich das Gehalt aus verschiedenen Faktoren multiplikativ zusammensetzt, führt ein Logarithmieren - unter Berücksichtigung der vermuteten Einkommensfaktoren des Gehaltes – für die folgende Modellschätzung zu der allgemeinen Form:

$$\begin{aligned}\ln(Gehalt) = {} & \alpha_0 + \alpha_1 Alter + \alpha_2 Alter^2 + \alpha_3 BLS + \alpha_4 BLS^2 + \alpha_5 LS + \alpha_6 LS^2 \\ & + \alpha_7 Tore + \alpha_8 Torwart + \alpha_9 Abwehr + \alpha_{10} Mittelfeld + \alpha_{11} Sturm \\ & + \alpha_{12} Kapitän + \alpha_{13} TD + \alpha_{14} SD + \alpha_{15} HD + \varepsilon\end{aligned}$$

Als Gehalt wird hierbei der aus dem Managerspiel approximierte Wert verwendet. Das Alter der Spieler wird zu Saisonbeginn in Jahren gemessen, während bei den absolvierten Bundesligaspielen (BLS) und Länderspielen (LS), sowie den erzielten Bundesligatoren (Tore) jeweils auf die ausgewiesenen Karriereleistungen vor Beginn des ersten Spieltages der jeweiligen Saison verwiesen wird. Um weitere mögliche Einflussfaktoren bei der Gehaltsdeterminierung abzubilden, werden Dummy-Variablen für die verschiedenen Vereine, die Saisons und die Herkunft der Spieler inkludiert. Die Vereinsdummies (TD) bildet hierbei die, persistent vorherrschenden, unterschiedlichen finanziellen Möglichkeiten ab, welche auch Auswirkungen auf die gezahlten Gehälter bei den verschiedenen Vereinen haben dürften. Mit Hilfe der Saisondummies (SD) wird versucht, die allgemeine Gehaltsentwicklung in der Fußballbundesliga über die verschiedenen Spielzeiten abzubilden. Vergleicht man das Durchschnittsgehalt der Saison 1995/1996 (565.681 Euro) mit dem der Saison 2007/2008 (1.288.702 Euro), so lässt sich ein starker Anstieg der Entlohnung von Bundesligaprofis erkennen, welcher die Verwendung eines Saison-Dummies in die Modellschätzung rechtfertigt. Eine grafische Darstellung der Gehaltsentwicklung unter Berücksichtigung der Position auf dem Spielfeld bietet Figure 2-2. Hier lässt sich eine positive Gehaltsentwicklung, unabhängig von

[17] Zudem sind die Koeffizienten des Fixed-Effects Modells, insbesondere die der Kapitänsvariablen, sehr ähnlich, sodass uns die Verwendung des Random Effects-Modells vertretbar erscheint.

der Position erkennen. Über den gesamten Beobachtungszeitraum hinweg werden Spieler umso besser bezahlt, je offensiver ihre Position auf dem Spielfeld ist.

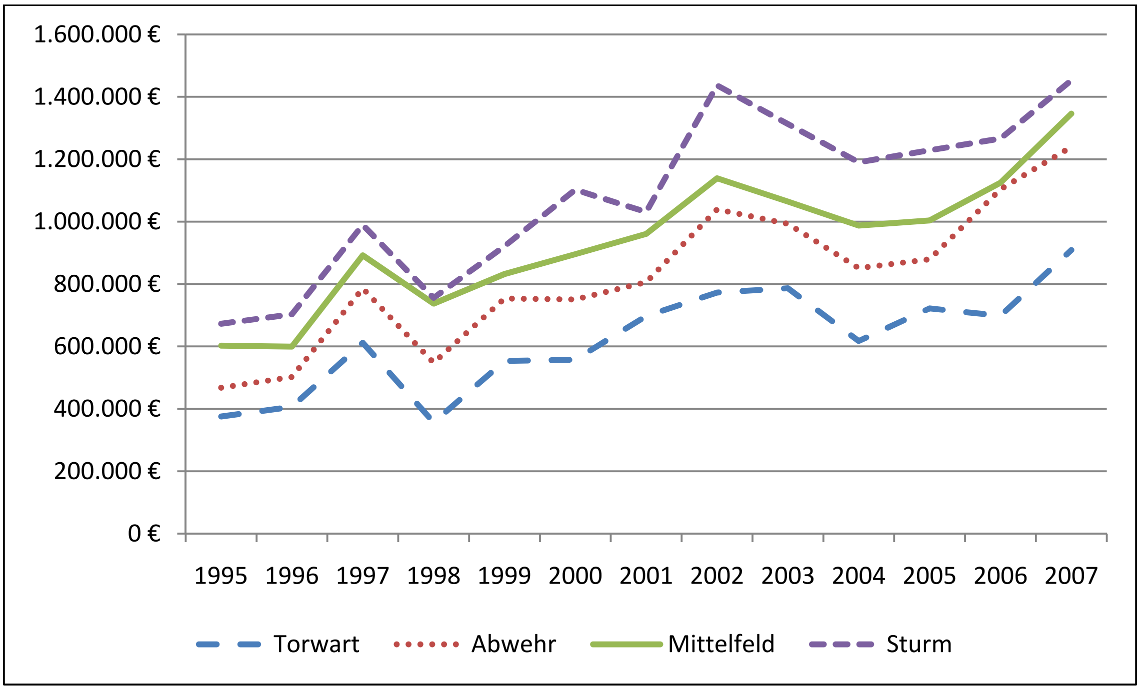

Figure 2-2: Salary History of Players in the Bundesliga Subject to the Positions on the Field

Durch das Einschließen von Informationen über die Herkunft der Spieler (HD) wird eine mögliche Diskriminierung im Sinne von geringeren Lohnzahlungen berücksichtigt. Nach der Liberalisierung des Spielermarktes im Profifußball im Rahmen des „Bosman-Urteils" aus dem Jahr 1995 gilt es zu prüfen, welchen Einfluss die Nationalität auf das Gehalt nimmt.[18] Bei der Modellschätzung wird daher nach Herkunft der Spieler zwischen Deutschland, Westeuropa, Osteuropa, Afrika, Südamerika, Nordamerika und Australien bzw. Asien unterschieden.[19]

Ein möglicherweise vorliegendes Kausalitätsproblem bezüglich der Kapitänsvariablen und den Spielergehältern ist nicht zu vernachlässigen. Es wäre zu befürchten, dass die Gehaltshöhe die Wahrscheinlichkeit der Übernahme des Kapitänsamtes beeinflusst und bevorzugt besser verdienende Spieler zum Kapitän berufen werden. Um dieser Proble-

[18] Vergleiche Antonioni und Cubbin (2000), Frick und Wagner (1996) und Frick (2008, 2009).
[19] Einen Überblick über die Literatur bezüglich der ethnischen Diskriminierung von Profisportlern bietet Kahn (1991). Darüber hinaus liefert Kalter (1999) Befunde für die deutsche Fußballbundesliga.

matik zu begegnen, wird die Schätzung des Lohns in Modell 2 nicht unter Berücksichtigung der aktuellen Besetzung (Saison t) des Kapitänspostens durchgeführt, sondern unter der Fragestellung, ob der Spieler in der vorherigen Spielzeit (Saison t-1) Kapitän war. Hierdurch verringert sich die Anzahl der Spieler mit dem Merkmal Kapitän von 234 auf 169. Diese Reduktion lässt sich dadurch erklären, dass im vorliegenden Datensatz 65 Bundesligakapitäne der Vorsaison entweder in einer unterklassigen deutschen Liga oder im Ausland gespielt haben.

	Modell 1		**Modell 2**	
	Koeffizienten		Koeffizienten	
Variable	**OLS**	**RE**	**OLS**	**RE**
Alter	0,659 (24,77)***	0,690 (25,09)***	0,657 (24,55)***	0,729 (28,81)***
Alter²	-0,012 (-27,49)***	-0,013 (-27,20)***	-0,012 (-27,19)***	-0,013 (-27,02)***
BLS	0,004 (11,67)***	0,002 (4,60)***	0,004 (11,63)***	0,002 (4,85)***
BLS²	-0,000 (-8,63)***	-0,000 (-4,01)***	-0,000 (-8,46)***	-0,000 (-4,06)***
GP INT	0,017 (11,44)***	0,012 (6,59)***	0,018 (11,86)***	0,012 (6,92)***
GP INT²	-0,000 (-6,93)***	-0,000 (-4,11)***	-0,000 (-7,21)***	-0,000 (-4,27)***
Tore	0,002 (2,15)**	-0,000 (-0,21)+	0,002 (2,02)**	-0,000 (0,28)+
Abwehr	0,173 (5,28)***	0,307 (6,39)***	0,175 (5,29)***	0,297 (6,14)***
Mittelfeld	0,278 (8,65)***	0,388 (8,23)***	0,277 (8,58)***	0,385 (8,12)***
Sturm	0,425 (11,80)***	0,489 (9,57)***	0,420 (11,59)***	0,479 (9,34)***
Südamerika	0,565 (13,01)***	0,616 (9,66)***	0,560 (12,82)***	0,619 (9,65)***
Nordamerika	-0,125 (-1,27)+	-0,045 (-0,34)+	-0,111 (-1,13)+	0,002 (0,02)+
Osteuropa	0,150(5,30)***	0,181 (4,52)***	0,139 (4,92)***	0,170 (4,22)***
Westeuropa	0,287 (9,29)***	0,347 (8,20)***	0,285 (9,19)***	0,347 (8,17)***
Afrika	0,059 (1,39)+	0,169 (2,75)***	0,047 (1,09)+	0,155 (2,51)**
Asien/Austr.	0,079 (1,30)+	0,159 (1,86)*	0,068 (1,11)+	0,139 (1,62)+
Kapitän (t)	**0,511 (10,56)*** **	**0,396 (8,64)*** **	**/**	**/**
Kapitän (t-1)	**/**	**/**	**0,369 (6,15)*** **	**0,224 (4,05)*** **
Saison-Dummies	Berücksichtigt			
Team-Dummies	Berücksichtigt			
Adj R^2	0,477	0,456	0,470	0,449
Fallzahl	6147		6147	

*p<0,10; **p<0,05; ***p<0,01; + n. s. (t-Werte bzw. z-Werte in Klammern).

Table 2-3: Determinants of Player Salary in the German Bundesliga

Die Ergebnisse der Regressionsschätzungen werden in Table 2-3 präsentiert. Hier lässt sich das bereits vermutete umgekehrt U-förmige Alters-Einkommens-Profil erkennen. Analog hierzu ist jeweils ein positiver Einfluss der Partizipation an Bundesliga- und Länderspielen, bei gleichzeitig negativem Grenznutzen zu beobachten. Der Einfluss von Erfahrung auf das Salär von Bundesligaprofis ist also sowohl auf nationaler, als auch auf internationaler Ebene erwartungsgemäß, wobei die Einsätze bei Länderspielen einen größeren Einfluss auf das Gehalt haben als Bundesligaspiele.[20] Betrachtet man den Einfluss der Position der Spieler auf das Gehalt, so fällt auf, dass Feldspieler, im Vergleich zur Referenzposition Torwart, signifikant mehr verdienen. Dies lässt sich möglicherweise durch die, bereits angesprochene, geringe Flexibilität der Torwarte hinsichtlich ihres Einsatzes auf anderen Positionen erklären sowie über die Berücksichtigung der Variablen "Tore". Hierüber hinaus wird die Bedeutung der Herkunft der Spieler für das Gehalt deutlich. Im Vergleich zum Referenzland Deutschland verdienen Spieler aus Südamerika, Osteuropa und Westeuropa signifikant mehr.

Um der zentralen Fragestellung, der monetären Entlohnung von Führungsqualitäten, nachzugehen, betrachten wir die Ausprägung der beiden Kapitänsvariablen. Als Hauptergebnis unserer Arbeit stellen wir fest, dass die Ausübung des Kapitänsamtes einen signifikant positiven Einfluss auf das Spielergehalt hat. Halvorsen und Palmquist (1980) zeigen, dass bei semilogarithmischen Gleichungen der Koeffizient der Dummy-Variablen nicht als prozentualer Einfluss interpretiert werden darf. Stattdessen sei der prozentuale Einfluss als 100*(exp(K)-1) zu berechnen, wobei K der Koeffizient der Dummy-Variablen ist. Hiernach erhält der Mannschaftskapitän, je nach Schätzmethode, ein Surplus zwischen 25,61 und 66,70 Prozent. Dies bestätigt unsere eingangs formulierte Hypothese, dass auch im professionellen Teamsport Führungsqualitäten pekuniär entlohnt werden. Einem eventuellen Endogenitätsproblem der Kapitänsvariablen kann durch eine analoge Regressionsanalyse, jetzt unter Berücksichtigung des Kapitäns des Vorjahres, Rechnung getragen werden (Modell 2). Auch im Rahmen dieser zweiten Modellschätzung kann der erwartete Einfluss des Kapitänsamtes auf das Spielergehalt nachgewiesen werden. Dieser ist abermals hochsignifikant positiv und spricht dem

[20] Im neunten Kapitel wird hierauf detailliert eingegangen.

Kapitän einen Einkommensbonus zwischen 25,11 und 43,62 Prozent zu. Somit scheint die Exogenität der hier zentralen Variablen Kapitän (t) gegeben.

Wie bereits angesprochen, wechselten im Beobachtungszeitraum viele Spieler die Position. Es stellt sich hierzu die Frage, inwieweit diese Flexibilität Einfluss auf das Spielergehalt nimmt. Daher wird für die folgende Analyse eine weitere Variable generiert, die einen Positionswechsel im Karriereverlauf abbildet (Wechsel Position). Für Table 2-4 wird die vorherige Regressionsgleichung um diese Variable erweitert. Es zeigt sich, dass kein signifikanter Einfluss auf das Gehalt messbar ist. Dies kann den Grund haben, dass ältere Spieler auf eine Position wechseln, die geringere Anforderungen an die körperliche Verfassung stellt. Dies würde den erwarteten Gehaltsbonus für die Flexibilität wettmachen.

	Modell 1		Modell 2	
	Koeffizienten		Koeffizienten	
Variabel	**OLS**	**RE**	**OLS**	**RE**
Alter	0.660 (24.77)***	0.687 (24.92)***	0.658 (24.55)***	0.685 (24.74)***
Alter²	-0.013 (-27.49)***	-0.013 (-27.03)***	-0.012 (-27.19)***	-0.013 (-26.80)***
BLS	0.004 (11.64)***	0.002 (4.35)***	0.004 (11.62)***	0.002 (4.39)***
BLS²	-0.000 (-8.66)***	-0.000 (-3.88)***	-0.000 (-8.50)***	-0.000 (-3.87)***
GP INT	0.017 (11.42)***	0.012 (6.63)***	0.018 (11.84)***	0.012 (6.96)***
GP INT²	-0.000 (-6.90)***	-0.000 (-4.16)***	-0.000 (-7.18)***	-0.000 (-4.41)***
Tore	0.002 (2.12)**	-0.000 (-0.14)+	0.001 (1.97)**	-0.000 (-0.25)+
Abwehr	0.176 (5.32)***	0.299 (6.20)***	0.179 (5.36)***	0.299 (6.15)***
Mittelfeld	0.280 (8.67)***	0.385 (8.17)***	0.281 (8.62)***	0.385 (8.13)***
Sturm	0.427 (11.82)***	0.487 (9.53)***	0.422 (11.62)***	0.482 (9.38)***
Südamerika	0.564 (12.98)***	0.618 (9.69)***	0.559 (12.79)***	0.613 (9.56)***
Nordamerika	-0.126 (-1.28)+	-0.043 (-0.32)+	-0.113 (-1.14)+	-0.030 (-0.22)+
Osteuropa	0.148 (5.27)***	0.182 (4.55)***	0.138 (4.88)***	0.172 (4.28)***
Westeuropa	0.287 (9.29)***	0.348 (8.22)***	0.285 (9.15)***	0.345 (8.12)***
Afrika	0.060 (1.39)+	0.168 (2.73)***	0.047 (1.09)+	0.159 (2.56)**
Asien/Austr.	0.080 (1.31)+	0.158 (1.85)*	0.069 (1.13)+	0.150 (1.75)*
Wechsel Pos.	-0.020 (-0.69)+	0.051 (1.51)+	-0.026 (-0.86)+	0.046 (1.36)+
Kapitän (t)	**0.510 (10.53)*** **	**0.398 (8.67)*** **	**/**	**/**
Kapitän (t-1)	**/**	**/**	**0.368 (6.12)*** **	**0.229 (4.14)*** **
Saison-Dummies	Berücksichtigt			
Team-Dummies	Berücksichtigt			
Adj R^2	0.477	0.456	0.47	0.449
Fallzahl	6147		6147	

*p<0,10; **p<0,05; ***p<0,01; + n. s. (t-Werte bzw. z-Werte in Klammern).

Table 2-4: Determinants of Player Salary in the German Bundesliga Including Flexibility

Aufgrund der linkssteilen und rechtsschiefen Verteilung der Spielergehälter wird in vielen aktuellen Arbeiten bei der Gehaltsschätzung auch auf Quantilsregressionen zurückgegriffen.[21] Auch für den vorliegenden Datensatz lässt sich eine Normalverteilung der Gehaltsvariablen widerlegen. Schätzt man nun für die beiden Modellspezifikationen Quantilsregressionen (0,10; 0,25; 0,50; 0,75; 0,90 Quantil) um den Einfluss der exogenen Variablen in verschiedenen Bereichen der Lohnverteilung zu messen, so fällt auf, dass die Ergebnisse der Einkommensschätzungen denen der

[21] Vergleiche Berri und Simmons (2009), Simmons und Berri (2009) und Vincent und Eastman (2009) für aktuelle Untersuchungen für den nordamerikanischen Teamsport.

Random Effects-Schätzungen sehr ähnlich sind. Da die Koeffizienten, bis auf wenige Ausnahmen, über die Perzentile sehr konstant sind, lässt sich schlussfolgern, dass der Einfluss der erklärenden Variablen auf die Gehälter an verschiedenen Stellen der Einkommensverteilung nahezu identisch ist. Gerade der Einfluss der Kapitänsvariablen ist über alle Perzentile hinweg signifikant positiv und bestätigt die Vermutung, dass Führungsqualitäten einen entscheidenden Einfluss auf die Spielergehälter nehmen. Auf den ersten Blick verwundert der abnehmende Koeffizient des „Kapitän-Dummies" über die Perzentile. Hierfür bietet sich jedoch eine simple Erklärung an: Die Anzahl der Spieler in den höchsten Perzentilen ist nicht über alle Teams gleichmäßig verteilt. Von den 580 höchstbezahlten Spielern spielten 145 beim FC Bayern München. Da aber jeder Verein jeweils einen Kapitän je Saison stellt, gibt es Kapitäne, die aufgrund der Budgetrestriktionen der Vereine nicht zu den „Topverdienern" der Liga gehören. Eine Darstellung der Schätzergebnisse der Quantilsregressionen, jeweils für Modellspezifikation 1 und Modellspezifikation 2, findet sich nachfolgend in Table 2-5 und Table 2-6.[22]

[22] Die Ergebnisse der Bootstrap und Jackknife Methode sind analog.

Variable	0,1 Quantil	0,25 Quantil	0,5 Quantil	0,75 Quantil	0,9 Quantil
Alter	,7721***	,8306***	,7058***	,5726***	,4362***
Alter^2	-,0137***	-,0148***	-,0127***	-,0105***	-,0081***
BLS	,0053***	,0045***	,0038***	,0028***	,0017***
BLS^2	-,0000***	-,0000***	-,0000***	-,0000***	-,0000 **
GP INT	,0205***	,0155***	,0155***	,0163***	,0173***
GP INT^2	-,0002***	-,0001***	-,0001***	-,0001***	-,0001***
Tore	,0007 +	,0035***	,0039***	,0027***	,0028 **
Abwehr	,3674***	,3167***	,1814***	-,0105 +	-,1683***
Mittelfeld	,4939***	,3718***	,2643***	,1282***	,0005 +
Sturm	,5957***	,4754***	,3918***	,2872***	,1594***
Südamerika	,5142***	,5330***	,5262***	,5200***	,5013***
Nordamerika	-,0826 +	-,0538 +	-,0019 +	-,0967 +	-,1804 +
Osteuropa	,1854***	,1685***	,1241***	,1130***	,0701 +
Westeuropa	,3451***	,3367***	,3096***	,2100***	,1627***
Afrika	,0892 +	,1264 **	,0438 +	-,0066 +	-,0054 +
Asien/Austr.	,2035 **	,1686 **	,0699 +	-,0773 +	,1510 +
Kapitän (t)	**,6252*** **	**,5700*** **	**,5168*** **	**,4410*** **	**,3161*** **
Pseudo R^2	,3150	,3114	,2932	,2879	,2966
Fallzahl	6147	6147	6147	6147	6147
Raw Sum of Dev.	2.196,5	3.891,5	4.656,6	3.577,4	1.934,0
Min Sum of Dev.	1.504,5	2.679,6	3.291,4	2.547,4	1.360,3

*p<0,10; **p<0,05; ***p<0,01; + n. s.

Table 2-5: Quantile Regressions of Player Salary in the Bundesliga (Model 1)

Variable	0,1 Quantil	0,25 Quantil	0,5 Quantil	0,75 Quantil	0,9 Quantil
Alter	,7774***	,8455***	,7033***	,5416***	,4618***
$Alter^2$	-,0138***	-,0150***	-,0126***	-,0099***	-,0085***
BLS	,0058***	,0042***	,0039***	,0032***	,0017***
BLS^2	-,0000***	-,0000***	-,0000***	-,0000***	-,0000 **
GP INT	,0181***	,0167***	,0165***	,0175***	,0165***
GP INT^2	-,0001***	-,0001***	-,0001***	-,0001***	-,0001***
Tore	,0014 +	,0038***	,0040***	,0023 **	,0027 **
Abwehr	,3830***	,3087***	,1834***	-,0178 +	-,1530***
Mittelfeld	,4695***	,3630***	,2704***	,1178***	,0178 +
Sturm	,5746***	,4566***	,3860***	,2713***	,1753***
Südamerika	,4913***	,5054***	,5108***	,5317***	,5003***
Nordamerika	-,0727 +	-,0403 +	-,0078 +	-,0732 +	-,0632 +
Osteuropa	,1794***	,1555***	,1268***	,1090***	,0556 +
Westeuropa	,3343***	,3324***	,3051***	,2018***	,1614***
Afrika	,1093 +	,0996 +	,0320 +	-,0169 +	-,0017 +
Asien/Austr.	,2510 **	,1539 *	,0579 +	-,0860 +	,1844 +
Kapitän (t-1)	**,3786*** **	**,4751*** **	**,4402*** **	**,3293*** **	**,3063*** **
Pseudo R^2	,3108	,3071	,2877	,2817	,2921
Fallzahl	6147	6147	6147	6147	6147
Raw Sum of Dev.	2.196,5	3.891,5	4.656,6	3.577,4	1.934,0
Min Sum of Dev.	1.513,9	2.696,6	3.316,9	2.569,6	1.369,0

*p<0,10; **p<0,05; ***p<0,01; + n. s.

Table 2-6: Quantile Regressions of Player Salary in the Bundesliga (Model 2)

2.4 Summary and Implications

Das aktuelle Kapitel liefert empirische Evidenz für die monetäre Entlohnung von Führungsqualitäten im professionellen Teamsport. Da sich der Aufsatz auf die deutsche Fußballbundesliga beschränkt, ergeben sich eine Vielzahl von denkbaren weiterführenden Arbeiten. Hier wäre es zum Beispiel von Interesse, inwieweit sich der monetäre Einfluss des Kapitänsamtes mit der Mannschaftsgröße verändert. Aus organisationsökonomischer Sicht wäre zu erwarten, dass mit steigender Anzahl an Teammitgliedern das Gehaltssurplus für die Übernahme der Kapitänsposition aufgrund des größeren Koordinationsaufwands steigt. Darüber hinaus könnte der Einfluss von verschieden großen Führungsteams analysiert werden. Einige Sportarten, wie beispielsweise der US-amerikanische Basketball, weisen unterschiedliche Anzahlen von Kapitänen je Team auf. Beim Basketball schwankt diese zwischen einem und drei Kapitänen. Inwieweit diese Streuung der Führungsverantwortung einen monetären Einfluss nimmt, wäre ein weiterer interessanter Ansatzpunkt für weitere Untersuchungen. Hier ist zu erwarten, dass die Bündelung der Führungsaufgaben auf einen einzigen Kapitän für diesen zu dem größten Gehaltsbonus führt.

3 The Payoff to Leadership in Teams

3.1 Introduction

The presence of a leader is often said to be decisive for the success of a team. While the sum of individual skills of the team members might be a good indicator for the potential of a group, a team leader is expected to improve his teams' performance by directing his team mates. This ability is assumed to be compensated monetarily. In professional sports a team captain is said to have responsibility for the strategy as well as teamwork. Since this requires leadership skills, the analysis of the monetary reward for captaincy is the main subject of this chapter.

Looking at the existing literature one finds many articles explaining which factors influence the players' salary in the National Hockey League (NHL), using data sets from different seasons and including various kinds of performance indicators. In an early study Jones and Walsh (1988) analyze the influence of players' skills on their respective salaries. They also focus on the influence of penalty minutes on players' salary, as they predict that players who play with a higher intensity, which results in a higher number of penalty minutes, earn significantly more. By clustering players into the two groups "grunts" and "non-grunts", Jones, Nadeau and Walsh (1997) provide a rational for both types of players to find employment in the National Hockey League, as a market for both player types exists. The authors also show that the structure of salaries differs for both groups of players, even through the main salary for both groups does not differ statistically.

There also exists a large body of literature concerning salary discrimination against French-Canadian players in the National Hockey League. Longley (1995), Lavoie (2000) and others investigate on this subject, ending up with mixed findings about this subject.[23] Using a stochastic frontier approach, Kahane (2005) picks up this topic, and estimates an optimal relative presence of French-Canadian players for a given payroll.

[23] See Kahn (1991) for a general survey on discrimination in professional sports.

He shows greater inefficiencies for National Hockey League teams which have an over-representation of Francophone players.

Regarding leadership skills, most research has been done concerning big company managers, whose ability to lead others is often concerned to be a “soft skill”. Hence the question arises, why some individuals develop leadership skills while others do not. Kuhn and Weinberger (2005) investigate the influence of occupying leadership positions in high school on the later salary. They identify team captains and club presidents as individuals who take leadership positions during high school and hereby accumulate important leadership skills for their further career. While accounting for cognitive skills as well as psychological and physical indicators on the individual basis, the authors show that men who possessed one of the named positions during high school receive a wage premium between 4 and 24 percent a decade later. In a related research Barron, Ewing and Waddell (2000) show that students who participate in extracurricular sport activities during high school years later earn a wage premium between 4 and 15 percent over students, who participated in non-sport extracurricular activities.

To summarize, the literature offers different approaches to measure factors that influence players’ salary in team sports, especially for the National Hockey League. Additionally, a big body of literature is devoted to leadership skills, describing the development of leadership skills. This chapter combines these two fields as it measures the impact of leadership skills on players’ salaries. Since team captains are expected to possess this ability, the main goal of this chapter is to measure the wage premium for team captains in the National Hockey League. Using a data set containing four successive seasons I show that, other things equal, players are paid an extra 21 to 35 percent for serving as team captains.

The chapter is organized as follows: The next section describes the data and presents the goals of the chapter. Section three presents the results obtained from the analyses of the data set. Finally, the chapter concludes with section four.

3.2 Data

The data set that I analyze in this chapter contains individual statistics of all ice hockey players who played in the National Hockey League between the 2003/2004 and the 2007/2008 season. Due to the NHL lockout in 2004/2005 which resulted in the cancellation of the entire season, our data set contains four seasons. Since salary information is not available for all players, the data set totals in 1067 players and 2773 player-year-observations. The NHL had 30 teams during the observed period with 82 regular season games per team. This leads to 1230 games in each of the four seasons and therefore the data set includes statistics from a total of 4920 regular season games. The vast majority of teams have just one team captain, while in rare cases teams report up to five captains. For the course of four seasons 148 team captains were reported. Our data set excludes goalkeepers, since the official rules prohibit them to act as a team captains.[24] Individual player statistics were drawn from the leagues official website at http://www.nhl.com, while player salaries were obtained from the website of USA Today at http://content.usatoday.com/sports/hockey/nhl/salaries/default.aspx. Finally, information concerning the team captains was taken from the "NHL Official Guide & Record Book 2009".

In the National Hockey League, the team captain is selected before the start of each season and has a capital "C" sewn on the left side of his jersey to distinguish him from his teammates.[25] He is the only player who is allowed to talk to the referees about the interpretation of rules during the game. To minimize delay in case of disagreement about a call, the league disallows goalkeepers to be team captains. Beside the named competency, the main task for the team captain is to be a leader during games as well as before and after games in the locker room. Furthermore he is the one who is responsible to represent his teammates' concerns to the team management.

The primary task of this chapter is to analyze how this leadership, displayed by the function of serving as team captain, is rewarded monetarily. Observing the years of

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[24] See official NHL rules, section 2, rule 6 at http://www.nhl.com/ext/0708rules.pdf.

[25] NHL teams also name alternate captains each season, who carry a capital "A" on their jersey. Unfortunately, information concerning alternate captains is unavailable.

experience team captains have, one can notice a nearly normal distribution around the average of eleven years of experience (see Figure 3-1). Hence it seems that leadership skills requires some experience in the league, as one observes an average experience of only 5.55 years for non team captains.

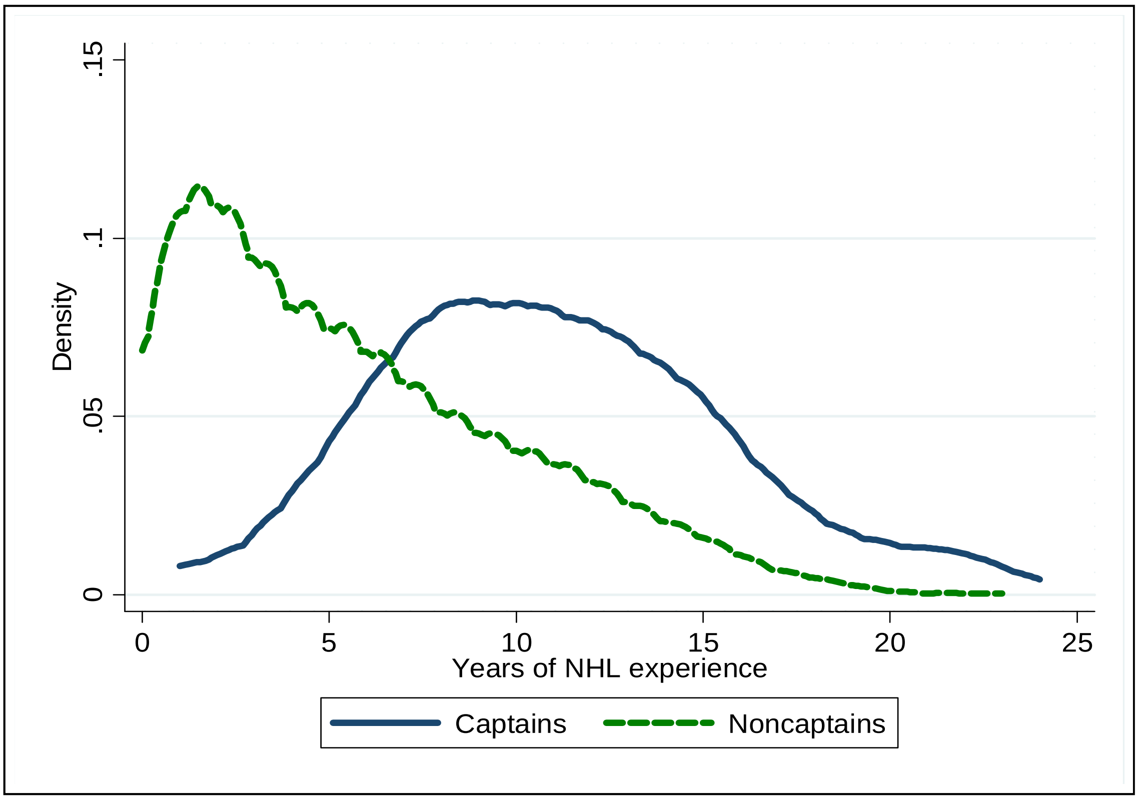

Figure 3-1: Kernel Density Estimation of Captains and Non-Captains NHL Experience

Besides the captaincy, one has got to consider other factors which influence players' salary. The present approach hence accounts for a variety of individual characteristics presented in Table 3-1. Players' experience is expected to have a positive impact according to the human capital theory. Therefore I consider years played in the National Hockey League prior to the respective season to display players' experience in the league. Human capital theory lets us expect a positive impact of experience on salary accompanied with decreasing marginal returns, which would result in an upward-sloping experience-earnings profile with diminishing returns to experience. Accordingly, one also has to consider the squared experience of the players.[26] Especially in a fast-

[26] See also Idson and Kahane (2000).

paced game like hockey decreasing speed and agility can be hardly compensated by additional experience.[27]

All-star game appearances seem to be an appropriate indicator to display players' talents. Participating in this yearly event, which had been cancelled three times during the last 20 years due to a lockout or to simultaneously proceeding Winter Olympic Games, clearly allows distinguishing between talent levels. This differentiation proves to be quite important, since superstars have a big impact on media attention and hence might influence their franchises value.[28]

The ability to occupy a certain position might also affect the individuals' salary. Hence I differentiate between four positions as I exclude goalkeepers because of aforementioned reasons. I control for the positions defenseman (DE), center (CE), right wing (RW) and left wing (LW). Throughout the observed period players typically do not switch their position. Altogether, it occurred just once that a player switched positions in between seasons.

Next to variables accounting for players' experience, talent and position, one also has to consider performance on the ice as an important factor which influences players' salary. Consequently, several individual statistics are included in the following salary determination. Considering games played during the regular season accounts for two things: First, it illustrates how important a player is to his teams' success. Secondly, it displays if a player is injury prone, since this would lead to a cutback in games played. Furthermore, points scored per game serves as an indicator for the offensive ability of players. Following Lavoie (2000) and others, the squared term of the achieved points per game is also included in the salary regression.

[27] See Fair (1994).

[28] For empirical evidence from the National Basketball Association (NBA) see Hausman and Leonard (1997).

Variable	Operationalization	Mean	Min.	Max.
Exp	Experience (seasons) in the league	5.83	0	24
Exp^2	Squared experience (seasons) in the league	55.31	0	576
ASG	All-star game appearances	0.45	0	15
ASG^2	Squared All-star game appearances	2.58	0	225
DE	Defender (dummy; yes = 1)	0.35	0	1
CE	Center (dummy; yes = 1)	0.26	0	1
RW	Right wing (dummy; yes = 1)	0.20	0	1
LW	Left wing (dummy; yes = 1)	0.19	0	1
GP	Games played	61.36	1	84
PPG	Points per game	0.39	0	1.6
PPG^2	Squared points per game	0.24	0	2.4
Captain (t)	Captain in current season (dummy; yes = 1)	0.05	0	1
Captain (t-1)	Captain in prior season (dummy; yes = 1)	0.04	0	1

Table 3-1: Descriptive Statistics of Player Characteristics and Performance Indicators

3.3 Empirical Analyses

To start off this chapter, I am going to analyze the salary structure of the National Hockey League. While the average salary for the observed period is 1,609,947 dollars one observes a right-skewed distribution of players' salary as the mean salary is comparatively low at 945,630 dollars (see Figure 3-2). Individual players' salaries range from 150,000 up to 13,500,000 dollars for one season. In the following regression analyses the natural logarithm of the salary is used as the dependent variable, as this is a better approximation to normal distribution.

Since the selected captains are expected to be players who spend a lot of minutes on the ice, their salaries range from 570,000 to 9,880,939 dollars, with an average salary of 3,903,226 dollars and a mean salary of 4,000,000 dollars. Hence the distribution of captain salaries is not as right-skewed as for the whole sample.

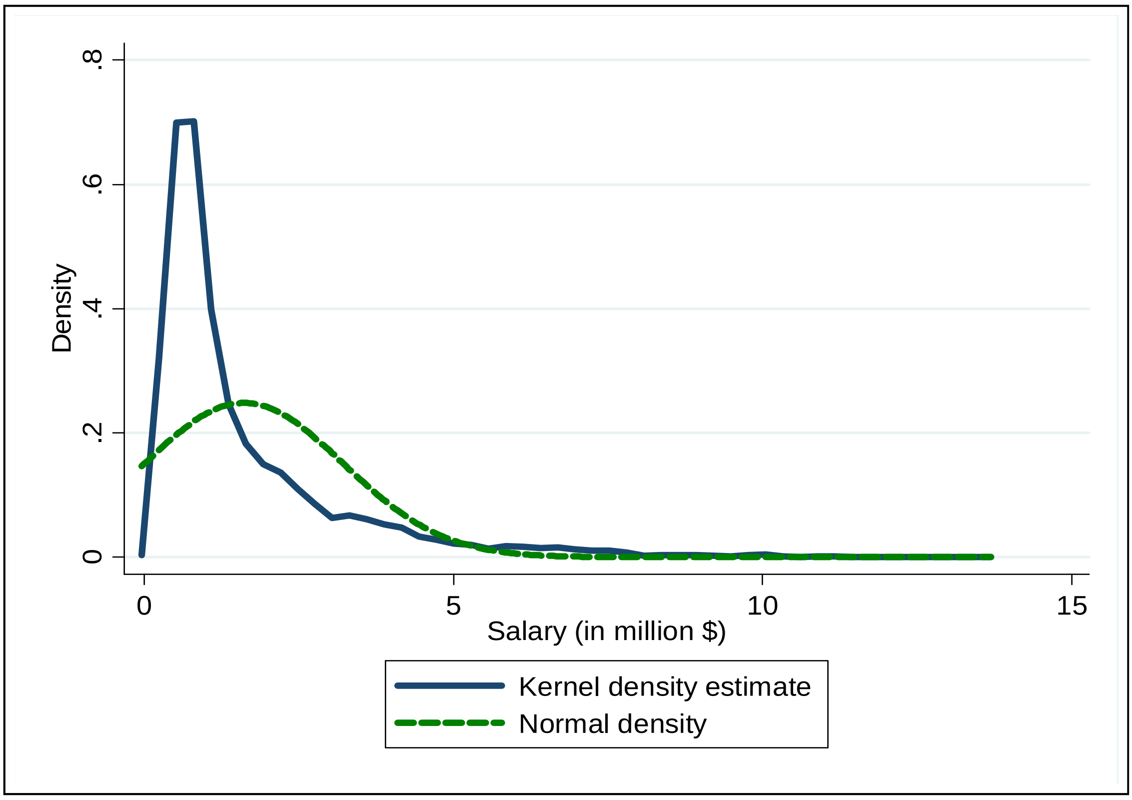

Figure 3-2: Kernel Density Estimation of the Salary in the NHL

As mentioned before, the lockout resulted in the cancellation of the 2004-05 NHL season, because the team owners and the NHL Players Association (NHLPA) did not consent on a new collective bargaining agreement. Subsequent to both sides agreeing to a new collective bargaining agreement during the summer of 2005, the total salary spending decreased considerably for the following season. Due to an agreed increase of the salary cap for the following seasons the average players' salary rose afterwards.

Following this rather general analysis of the players' salary I turn to the investigation of the impact of leadership on players' salary. For this purpose different regression models are being run, which also regard the individual characteristics and performance indicators described in the previous section. Hereby I distinguish the impact of leadership on our dependent variable, denoted by the players' log wage rate, from other influencing factors. On the basis of the standard Mincer (1974) wage equation the following equation to estimate the impact on salary is being suggested:

$$\begin{aligned} ln\,Salary = {} & \alpha_0 + \alpha_1 Exp + \alpha_2 Exp^2 + \alpha_3 Allstarapp + \alpha_4 Allstarapp^2 + \alpha_5 DE \\ & + \alpha_6 CE + \alpha_7 RW + \alpha_8 LW + \alpha_9 GP + \alpha_{10} GPG + \alpha_{11} ASP \\ & + \alpha_{12}\, Captain\,(t) + \alpha_{13}\, SD + \alpha_{14}\, TD + \varepsilon \end{aligned}$$

Due to the panel character of our data I apply a random effects model as well as a conventional OLS model. The random effects model accounts for unobservable factors which might influence the given individual effects.[29] One might argue that there could be an endogeneity problem, since the direction of causality between the dependent salary variable and the independent captain variable is not clear, as players might be appointed to be captains because they receive a large salary. In this regard a second regression analysis is being run, replacing the current team captains by the captains of the prior season. Hence the information on team captains in the 2002/03 season is included in the second model that uses salary information for 2003/04. Thus, the regression analysis for the 2003/04 season includes the captaincy information from the 2002/03 season (and so forth).

To account for further influencing factors, season dummies (SD) as well as team dummies (TD) are included in both models. The season dummies account for the discontinuous salary history within the league. As stated earlier, salaries dropped considerably after the lockout season and this is reflected by the season dummies. Furthermore, the team dummies depict prevailing differences in financial power. Teams' spending on salary ranged from 18,932,830 dollar by the Washington Capitals for the 2005/06 season to 77,856,109 dollar by the Detroit Red Wings for the 2003/04 campaign, displaying this heterogeneity between teams.

[29] See Mátyás / Sevestre (1996, p. 94).

	Model 1		Model 2	
	Coefficients		Coefficients	
Variable	**OLS**	**RE**	**OLS**	**RE**
Exp	0.143 (21.81)***	0.164 (21.59)***	0.143 (21.73)***	0.164 (21.63)***
Exp^2	-0.006 (-13.85)***	-0.008 (-15.26)***	-0.006 (-13.82)***	-0.008 (-15.36)***
ASG	0.236 (13.34)***	0.280 (12.04)***	0.238 (13.49)***	0.283 (12.21)***
ASG^2	-0.017 (-8.89)***	-0.017 (-6.97)***	-0.017 (-9.02)***	-0.017 (-7.13)***
DE	0.266 (10.60)***	0.164 (4.89)***	0.271 (10.78)***	0.168 (4.99)***
RW	-0.036 (-1.34)+	-0.062 (-1.67)*	-0.031 (-1.14)+	-0.058 (-1.57)+
LW	-0.021 (-0.77)+	-0.052 (-1.40)+	-0.020 (-0.74)+	-0.051 (-1.37)+
GP	0.002 (3.47)***	0.001 (1.09)+	0.002 (3.68)***	0.001 (1.29)+
PPG	1.492 (13.38)***	1.224 (10.48)***	1.517 (13.60)***	1.253 (10.75)***
PPG^2	-0.279 (-2.91)***	-0.330 (-3.34)***	-0.297 (-3.10)***	-0.361 (-3.66)***
Captain (t)	**0.314 (7.04)***	**0.211 (4.74)***	**/**	**/**
Captain (t-1)	**/**	**/**	**0.355 (7.37)***	**0.278 (5.83)***
Season Dum.	Included			
Team Dum.	Included			
Adj R^2	0.624	0.613	0.625	0.614
Number of obs	2773	2773	2773	2773

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance (z-values in brackets).

Table 3-2: Determinants of Player Salary in the NHL

Estimations are reported in Table 3-2. As one would expect the data goes in line with the human capital theory, as the experience-salary profile is upward sloping and concave (see Figure 3-3).

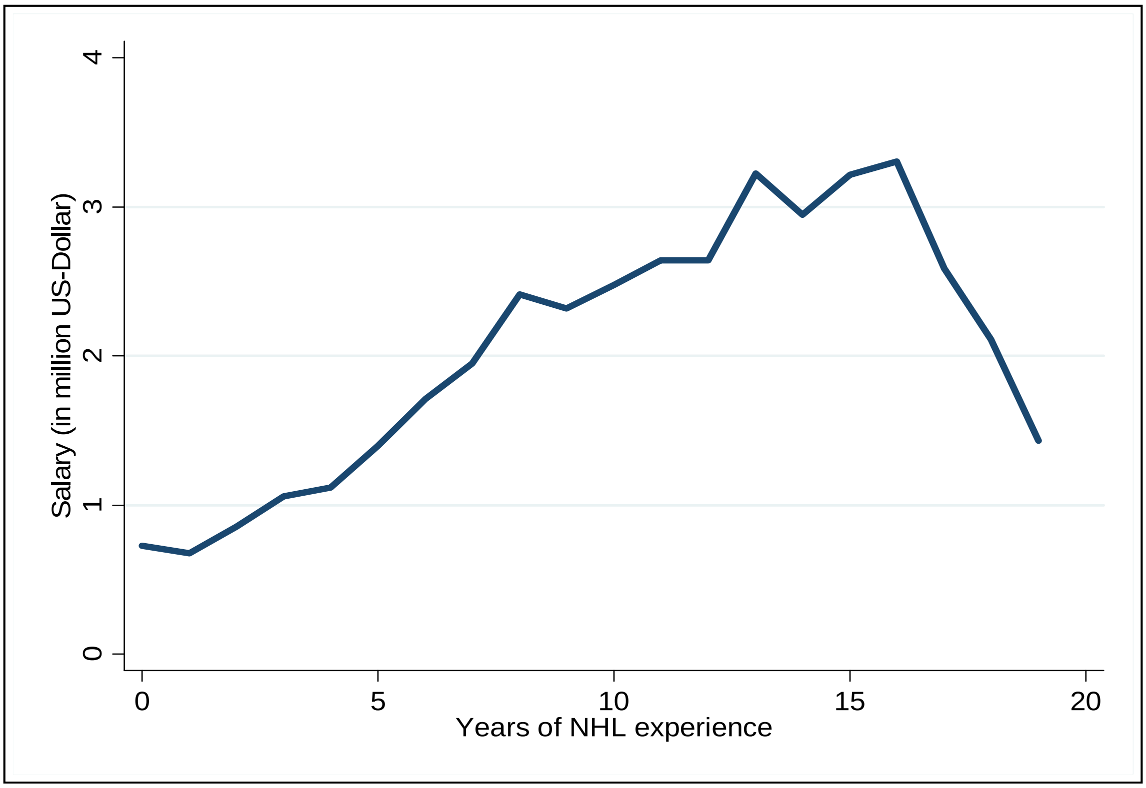

Figure 3-3: Experience-Salary Profile

The number of All-star game appearances enables one to separate between very good players and so-called star players. According to Rosen's (1981, 1983) theory of superstars even a marginal difference in talent leads to a considerable difference in salary. The squared number of All-star game appearances is also considered, as one expects decreasing marginal returns of appearances. Data supports the expected influence of All-star game experience, independent of the chosen model.

As I take the center position as the reference position there is no significant difference in salary between it and the other offensive positions right wing and left wing. Other things equal, defensemen earn significantly more than offensive players. This goes in line with Idson and Kahane (2000), who state that a defensemen with the same offensive skills as an offensive player earns more due to his additional defensive abilities.

Looking at the individual performance data, one finds the expected influence on the players' salary. Independent of the selected model, the number of games played during the regular season have a significant positive impact on the salary, as it displays players' skills as well as physical characteristics like fatigue and frequency of injuries. Servicing as offensive skill indicators, points per game and squared points per game both have a highly significant impact on players' salary. While points scored per game have a positive effect on players' salary, one can observe decreasing marginal returns.

To test the main hypothesis which claims that leadership skills in teams are rewarded monetarily, I look at the impact of the captain variable on players' salary. All regression analyses support the thesis that leadership is indeed rewarded, since the impact of the captain variables is significantly positive for all models. As the main result of the thesis I state that the teams' current captain, other things equal, is rewarded with a monetary bonus between 20 and 30 percent (Model 1) for obtaining his position.[30] To accommodate for the potential heterogeneity problem of the captain variable I take a look at the team captains of the previous season (Model 2). As expected this does not change the result, since the impact of this captain variable is also highly significant.

Since salaries in the NHL are not normally distributed which is supported by a skewness-kurtosis test for normality, I continue by performing quantile regressions for both models. This way, one can measure the impact of the independent variables at different parts of the salary distribution. As tables 3-3 and 3-4 report, coefficients are relatively constant throughout the quantiles. As in the previous chapter, the impact of the variable depicting the team captain decreases by the quantile. The argument goes in line with the one presented in the prior chapter. The number of players belonging to the highest quantiles is not equally distributed over all teams, but since every team has to name a team captain the impact of captain variable decreases over the quantiles.

[30] Following the line of argumentation by Halvorsen and Palmquist (1980) as in the second chapter, the surplus ranges between 23.5 and 36.9 percent.

Variable	0.1 Quantile	0.25 Quantile	0.5 Quantile	0.75 Quantile	0.9 Quantile
Exp	.0661***	.1124***	.1437***	.1548***	.1522***
Exp²	-.0032***	-.0048***	-.0057***	-.0056***	-.0056***
ASG	.4058***	.3284***	.2742***	.2116***	.1604***
ASG²	-.0378***	-.0264***	-.0214***	-.0146***	-.0100***
DE	.0704***	.1874***	.3032***	.3309***	.3518***
RW	-.0069 +	-.0091 +	-.0102 +	-.0810 **	-.0330 +
LW	.0245 +	.0049 +	.0280 +	.0851 **	.0401 +
GP	.0020***	.0028***	.0016***	.0009 +	-.0004 +
PPG	.5698***	1.1247***	1.4418***	1.6098***	1.9771***
PPG²	-.0387 +	-.0875 +	-.2249 *	-.3113 **	-.4847***
Captain (t)	**.4950*****	**.4180*****	**.2584*****	**.1783*****	**.1965*****
Pseudo R²	0.2033	0.3167	0.4184	0.4763	0.4773
Fallzahl	2773	2773	2773	2773	2773
Raw Sum of Dev.	533.9	1200.4	1792.3	1566.5	856.0
Min Sum of Dev.	425.3	820.3	1042.4	820.5	447.4

*p<0,10; **p<0,05; ***p<0,01; + n. s.

Table 3-3: Quantile Regressions of Player Salary in the NHL (Model 1)

Variable	0.1 Quantile	0.25 Quantile	0.5 Quantile	0.75 Quantile	0.9 Quantile
Exp	.0649***	.1125***	.1416***	.1580***	.1524***
Exp^2	-.0031***	-.0048***	-.0055***	-.0058***	-.0057***
ASG	.4063***	.3282***	.2596***	.2056***	.1744***
ASG^2	-.0389***	-.0265***	-.0192***	-.0142***	-.0112***
DE	.0674 **	.1968***	.3104***	.3153***	.3686***
RW	.0075 +	-.0053 +	.0036 +	-.0833 **	-.0173 +
LW	.0097 +	.0034 +	-.0218 +	-.0835 **	-.0392 +
GP	.0020***	.0027***	.0015 **	.0001 +	-.0002 +
PPG	.6193***	1.1680***	1.5120***	1.6081***	1.930***
PPG^2	-.0088 +	-.1012 +	-.2786 **	-.3145 **	-.4349***
Captain (t-1)	**.5729*** **	**.4229*** **	**.3306*** **	**.2167*** **	**.2863*** **
Pseudo R^2	0.1979	0.3161	0.4182	0.4767	0.4788
Fallzahl	2773	2773	2773	2773	2773
Raw Sum of Dev.	533.9	1200.4	1792.3	1566.5	856
Min Sum of Dev.	428.2	821.0	1042.8	819.7	446.2

*p<0,10; **p<0,05; ***p<0,01; + n. s.

Table 3-4: Quantile Regressions of Player Salary in the NHL (Model 2)

3.4 Conclusions

This article has investigated the impact of leadership in teams on individuals' salary. The empirical work has focused on the National Hockey League. Using data from four seasons it was shown that leadership skills, displayed by the captain variable, have a significant positive impact on players' salary. Depending on the chosen model, the pecuniary surplus for the team captains range between 21 and 35 percent. Further research might concentrate on other sports, possibly with a different team size and varying performance indicators. Theory of organization would lead us to the expectation of rising benefit of leadership as team size increases. A differentiation between roster size and actual number of players on the field might be necessary to distinguish between leadership on the field and leadership off the field. Next to this, further research on personal background of players might indicate under which circumstances individuals develop into leaders. In this content further information on players, concerning origin, education and earlier performance would be of great interest.

4 Performance under Pressure: Estimating the Returns to Mental Strength in Professional Basketball

4.1 Introduction

Human capital theory as developed by Gary S. Becker (1962, 1964) is clearly one of the cornerstones of modern labor and personnel economics. Since the term "human capital" refers to the stock of knowledge and expertise an individual brings to a job, any personal attributes and characteristics that are rewarded in a competitive labor market must be "skills". Building on this concept, Jacob Mincer (1974) a few years later developed and estimated what is now called the "earnings function". Here, an individual's earnings are modeled as a function of her formal qualification, i.e. the years of schooling and experience. Since the publication dates of these two seminal contributions, hundreds of studies using data from different countries and/or time periods have appeared, each seeking to identify the impact of age and highest school degree obtained on hourly, monthly or annual wages (for an overview see e.g. Card 1999).[31] Over the years, other (potential) determinants of an individual's wage have been added to the regression models: Apart from schooling and experience most studies now include variables like tenure with the current employer and the duration of non-employment spells, both of which are likely to affect an individual's stock of knowledge and expertise, too.

In two recent contributions Bowles, Gintis and Osborne (2001a, 2001b) have challenged the traditional view by arguing that the "standard" human capital variables explain little of the observable variance in earnings. Moreover, they find that variables that have been omitted so far in the empirical literature very often prove to be important determinants of an individual's labor market success. Most important among the omitted variables are "non-cognitive skills", which are usually defined and measured in terms of work habits

[31] Most of the more recent studies include additional variables that are considered valid measures of an individual's productivity (see e.g. Krueger 1993, DiNardo and Pischke 1997). Moreover, the adequacy of the initial specification has been questioned in a number of studies. Murphy and Welch (1990) for example argue that the standard formulation understates early career wage growth by about 30-50 percent and overstates midcareer earnings growth by 20-50 percent. They present a number of alternative specifications that seem to fit the data better. Depending on the treatment of economy-wide trends, the dating conventions for tenure and wages, the handling of wage observations that span multiple jobs and the estimation approaches used Altonji and Shakotko (1987), Topel (1991) and Altonji and Williams (2005) find huge variations in the returns to tenure.

(such as effort, determination and discipline) or in terms of personality traits (such as self-confidence, sociability and emotional stability) (ter Weel 2008: 729).

Although the literature on the impact of work habits and personality traits on labor market careers in general and on salaries in particular has grown rapidly over the last years (for an overview see e.g. Borghans et al. 2008), very few robust results have been presented so far. Most of the available studies suffer from the fact that the data used for estimation purposes cover a broad range of jobs where the returns to different work habits and personality traits are likely to vary considerably. This, in turn, is likely to bias the estimated coefficients downwards. Moreover, most of the available evidence is based on questionnaire responses to an often large number of statements intended to describe the respective individuals' personality structures.

This chapter tries to overcome these deficits by, first, restricting the empirical analysis to a particular dimension of an individual's personality that we henceforth either call "mental strength" or "mental toughness". Second, we avoid using subjective evaluations of individuals about their own personalities by restricting our analysis to observable behavior. Thus, we derive an "objective" measure of mental strength/toughness that we enter as an additional explanatory variable in our estimations. Contrary to most of the available literature, we use a data set with detailed information on workers who are employed in a quantitatively rather small and at the same time very specific labor market, the "National Basketball Association" (NBA). While the data precludes generalization of the findings beyond the professional team sports industry, it has the advantage that we have "clean" measures of individual productivity and performance as well as reliable information on individual salaries and that we can construct an unbiased measure of mental strength without having to ask the players to respond to a questionnaire to reveal their work habits and/or their personality traits.[32] Summarizing, the goal of this chapter is to analyze the impact of a particular (and presumably highly valued) capability of professional basketball players – to avoid "choking under pressure" or to score "when it really counts" – on the individuals' remuneration.

[32] For a detailed discussion of the advantages of sports data to test different labor market theories see Kahn (2000).

The chapter proceeds as follows: Section two reviews the available literature, section three describes the setting from which we derive the data used in the estimations (the NBA). In section four we present our findings and section five concludes.

4.2 What Can we Learn from the Available Literature?

4.2.1 Personality Traits and Earnings: A Review of the Evidence

While a large number of studies have documented the impact of cognitive ability (as measured by e.g. IQ test scores) on earnings, the impact of non-cognitive skills (such as motivation, persistence, dependability, etc.) has remained virtually unexplored (early examples include Andrisani 1978, Filer 1981 and Jencks 1979). [33] In the last five years, however, a large and still growing number of papers have studied the influence of personality traits on individuals' incomes. Irrespective of considerable differences in the independent variables used, in sample sizes and in cultural contexts all the studies suggest that wages are not only determined by "traditional" human capital measures and by cognitive abilities but are also affected by non-cognitive skills. Summarizing, these psychological traits have been found to account for as much as one third of the impact the traditional human capital variables have on individual earnings (Manning and Swaffield 2008).

The studies by e.g. Braakman (2009), Fortin (2008), Heckman et al. (2006), Mueller and Plug (2006), Nyhus and Pons (2005) as well as Osborne Groves (2005) are based on slightly different versions of the "five factor model" of personality structure, a widely accepted instrument among psychologists. The five personality traits are extroversion (a preference for human contact and attention and the wish to inspire other people), agreeableness (the willingness to help other people and to act in accordance with other people's interests), conscientiousness (a person's preference for following

[33] A further branch of literature examines the impact of physical attributes on earnings. First, a number of papers have examined the possible effects of physical height on earnings (see Persico, Postlewaite and Silverman 2004, Heineck 2005, Gautschi and Hangartner 2006, Hübler 2009). Second, a number of papers look at the impact of handedness on earnings (see Denny and O'Sullivan 2007, Ruebeck, Harrington and Moffitt 2007). Finally – and perhaps most interestingly – there are a number of papers looking at the impact of physical attractiveness ("beauty") on labor market outcomes (see e.g. Biddle and Hamermesh 1998, French 2002, Hamermesh and Biddle 1994 and Hamermesh, Meng and Zhang 2002).

rules and schedules), emotional stability (self-confidence, coolness) and autonomy/openness to experience (a person's propensity to make his or her own decisions and the degree of initiative and control).[34]

While all the papers quoted above interpret an individual's personality as a "bundle of productive attributes valued in the labor market" (Mueller and Plug 2006: 4), they differ in the data they use for estimation purposes: Nyhus and Pons (2005) use a representative sample of the Dutch population collected in 1996 while the study by Mueller and Plog (2006) is based on the "Wisconsin Longitudinal Study". Braakmann (2009) uses the 2005 wave of the German "Socio-Economic Panel", Fortin refers to the "National Longitudinal Study of the High School Class of 1972" and the "National Education Longitudinal Study" of 1988. Osborne Groves (2005) relies on the US "National Longitudinal Survey of Young Women" and the British "National Child Development Study" while Heckman et al. (2006) again use the "National Longitudinal Survey of Youth".

Not surprisingly, the findings presented in these studies are quite heterogeneous: Nyhus and Pons (2005) find that extraversion as well as agreeableness is both associated with significantly lower wages while emotional stability is associated with significantly higher wages.[35] These results are partly confirmed and partly rejected by Mueller and Plog (2006) who find that extraversion has no statistically significant impact on the wages of either men or women and that agreeableness is associated with a wage premium only for women. For men (but not for women), neuroticism (the opposite of emotional stability) is associated with a wage penalty. Finally, openness is found to have a significantly positive influence on wages for both, men and women. However, even the statistically significant coefficients are of marginal economic importance only. Braakmann (2009), in turn, finds that for both men and women, only conscientiousness has a statistically significant negative impact on individual wages while the remaining

[34] Apart from the papers quoted above, Drago (2008) studied the impact of "self-esteem" on wages, Liu and Wong (2005) looked at the influence of "loyalty" on individual wages, Ippolito (1996) at the impact of "reliability" on individual remuneration and Laband and Lentz (1999) at the role of having a mentor on subsequent earnings.

[35] The remaining two dimensions of the five factors inventory (autonomy and conscientiousness) proved to be statistically insignificant.

four coefficients are all insignificant in the wage equation for men. In the case of women, agreeableness as well as neuroticism is also associated with a significant wage penalty. Using somewhat different measures of personality traits Fortin (2008), Heckman et al. (2006) and Osborne Groves (2005) find that individuals reporting a high degree of self-esteem and/or a high degree of control over their life earn significantly higher wages than individuals believing that luck and fate determine success and achievement.

The most important common element of the remaining three studies is that they all use a more "objective" measure of another highly valued personal characteristic, i.e. leadership skills. Using three different data sets from 1960, 1972 and 1982 (with 8,000, 3,000 and 2,000 observations respectively) Kuhn and Weinberger (2005) find that among white men individuals who occupied leadership positions in high school (as president or as captain of a varsity team, for example) earn significantly more as adults. The leadership-wage effect varies, depending on model specification and time period, from 4-33 percent. Moreover, high school leaders are more likely to occupy managerial positions as adults, and leadership skills are associated with a higher wage premium in managerial positions than elsewhere. The two other studies looking at the influence of leadership skills on wages use data from two different professional team sports leagues: Deutscher (2009) relies on data from the National Hockey League over a period of five seasons (2003/04-2007/08) with some 2,800 player-year-observations while Battré, Deutscher and Frick (2009) analyze comparable data from the German "Bundesliga" over a period of thirteen consecutive seasons (1995/96-2007/08) with more than 6,500 player-year-observations. Both studies reveal that players who have been appointed team captain by the respective head coach earn significantly higher wages: Other things equal, hockey and football players who are captains earn a wage premium of some 20-35 percent. Evaluated at the respective mean this implies that captains earn about 300,000-500,000 $ (hockey) and 350,000-400,000 € (soccer) more per year than their teammates with a comparable performance on the ice/pitch.

Summarizing, it appears that, first, the studies using "representative" data are likely to underestimate the "true" impact of personality traits on earnings, because the returns to personality traits are likely to vary across occupations (see Cobb-Clark and Tan 2009). If, for example, extraversion is beneficial for sales people and teachers, but not for accountants, it is problematic to use a sample that includes sales people and teachers as well as accountants. Second, the significantly positive correlation between formal education and various measures of self-esteem, extraversion, agreeableness, emotional stability, etc. found in most studies is likely to result in a downward bias of the coefficients of either the former or the latter variables. Given these methodological problems we restrict our analysis to a particular labor market, where one of the five dimensions of an individual's personality, his emotional stability (something we call "mental strength" or "mental toughness" instead) is likely to be of prime importance for that person's performance (and, therefore, his income). Before explaining the institutional set-up of that particular labor market we will now briefly summarize the available literature analyzing the wage determinants of professional basketball players.

4.2.2 Performance and Remuneration in Professional Basketball

Since we use data from the professional team sports industry in the empirical section of this chapter it is helpful to take a brief look at the available studies that seek to identify the determinants of player salaries in that particular industry, i.e. professional basketball. Due to the availability of detailed and reliable information on player salaries, contract duration and performance/ productivity, a large number of studies have been published recently (see e.g. Kahn and Scherer 1988, Koch and Vander Hill 1988, Wallace 1988, Brown, Spiro and Keenan 1991, Jenkins 1996, Dey 1997, Hamilton 1997, Gius and Johnson 1998, Escker, Perez and Siegler 2004, Hill 2004, Prinz 2005). Perhaps surprisingly, none of the available studies has so far included a measure of "non-cognitive skills". Thus, the evidence only documents the returns to "standard" performance measures.[36]

[36] Significant impacts of experience, performance and peer reputation on salary can also be found in studies of other North American sports, see Kahn (1993) for baseball, Berri and Simmons (2009) and Simmons and Berri (2009) for American football and Idson and Kahane (2000) for hockey. Moreover, similar effects have been found in studies on European soccer (see Lehmann and Weigand 1999, Huebl and Swieter 2002, Lucifora and Simmons 2003, Lehmann and Schulze 2008, Garcia-del-Barrio and Pujol 2007, Frick 2007, Battré, Deutscher and Frick 2009).

Irrespective of the time period[37] and the size of the sample[38] these studies unanimously agree that player wages are a function of, first, a player's human capital (i.e. his ability/ potential as measured by his draft position and his years of experience), second, a player's "fan appeal" (as measured by his number of all star appearances) and, finally, his productivity (i.e. an individual's contribution to the "glamour statistics" such as scoring, rebounding and shot-blocking). While draft position, experience, tenure with the current team and number of all-star appearances all have a positive, yet decreasing impact on wages, minutes per game, points, rebounds, assists and blocks per minute have a positive and strictly linear influence. Moreover, height (Eschker et al. 2004, Hill 2004 and Prinz 2005) and contract length (Jenkins 1996) seem to have a positive influence on player wages too, while the impact of the number of previous teams is negative (Gius and Johnson 1998, Eschker et al. 2004, Prinz 2005).

Summarizing, it appears that the salaries of professional sports players are not just random, but that systematic factors determine these salaries to a large extent and that these systematic factors e.g. age, experience and performance are very similar to those found in other occupations.[39] However, the variation in salaries that can be explained with a small set of precisely measured right-hand side variables is quite large compared to the respective values in the studies that use data from representative labor market surveys (25-35 percent vs. 60-70 percent).

[37] Some studies use data from the mid 1980s (Koch and Vander Hill 1988, Kahn and Sherer 1988, Wallace 1988 and Brown, Spiro and Keenan 1991), some from the mid 1990s (Hamilton 1997, Gius and Johnson 1998). Most interesting, however, are the papers that use longitudinal data covering a period of five to ten consecutive seasons (Jenkins 1996, Dey 1997, Eschker, Perez and Siegler 2004, Hill 2004, Prinz 2005).

[38] Some of the samples are rather small (with slightly more than 200 observations) while others are quite large (with up to 4,500 player-year-observations).

[39] Where sports teams differ is that they apply more stringent selection procedures into occupations. For example, poor performance by a player results in being dropped from team squad and very quickly being discarded; there are high levels of mobility within the industry (between teams) and into and out of the industry, with shorter careers than in most occupations.

4.3 "Choking Under Pressure": The Fragility of Performance under Stress

The term "choking under pressure" is widely used in the academic literature as well as in the popular press to describe poor performance in response to what an individual perceives as an important and stress-filled situation:

> "Choking under pressure is not just poor performance. Rather, choking is sub-optimal performance – worse performance than expected given what the performer is capable of doing and what this performer has achieved in the past. This less-than-optimal performance does not reflect a random fluctuation in skill level (…), but rather occurs in response to a high-pressure situation" (Beilock and Gray 2007: 426).

The pressure experienced by many individuals – be it athletes in a competition, students in an exam or executives in a business meeting – can be the result of the level of rewards that the individuals expect to receive in the case of success (e.g. Baumeister 1984) or the level of punishment they fear in the case of failure (see e.g. Paulus 1983). Given the well-documented influence of pressure on performance[40], we seek to answer the question whether and to what extent an individual's ability to deal with pressure situations has an impact on that person's remuneration. More specifically, we analyze

[40] A significant amount of research has examined choking under pressure in laboratory settings rather than in actual game situations. While a laboratory environment provides a controlled setting in which performance failures can be studied while the amount and the players' perceptions of pressure can be manipulated. For example Leith (1988) found that individuals shooting free throws who were made aware of the fact that "some people have the tendency to choke at the free throw line" performed significantly worse than those who had not received that kind of information. Dohmen (2008a) finds that professional football players are more successful in penalty shot-outs when playing away games, i.e. when not playing in front of their fans (a finding that supports the related 'social pressure hypothesis').

the performance under pressure of professional basketball players[41] and the monetary returns to the ability to handle pressure situations.

To measure a player's "stress resistance" or "mental toughness" we compare his performance from the free throw line in "crucial game situations", i.e. during crunch-time with his performance during the rest of the game. As crunch-time we define the last five minutes of the 4th quarter of a match or overtime, when no team is ahead by more than five points. In that situation, the preconditions for "choking under pressure" are likely to be fulfilled: First, missing an opportunity to score is particularly problematic in a close match and, second, making a mistake that cannot be corrected as the match is coming to an end is particular problematic, too. Thus, pressure and stress are likely to increase towards the end of a match when the score is close.

Why are free throws particularly suited to study the impact of "stress resistance" and "mental strength" on individual performance (and, subsequently, on remuneration)? The free throw is a quite unique situation in sports: It is a routine task for a player without an opponent being able to deter him from hitting the basket. The distance from the free-throw line to the basket is 15 feet in every arena and there is no influence apart from crowd size and behavior. However, average attendance in the NBA is very similar across the teams[42] and the distance between the crowd and the player is the same in every NBA arena. Thus, the free throw is the only instance during a match where a player's output is independent of the efforts made by players of the opposing team. A player is awarded one or more free throws if he gets fouled while taking a shot, if he

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41 Anecdotal evidence abounds: With 90 seconds left to play in the national championship game in the 2008 NCAA men's division I basketball tournament, the Memphis Tigers had a six point lead over the Kansas Jayhawks. Kansas fouled strategically to send Memphis to the free throw line, hoping to see them fail. Memphis, with a previous 59 percent completion rate, missed four out of five free throws, helping Kansas to reach overtime and finally win the game. Another example: In the first game of the 1995 finals of the National Basketball Association (NBA) between the Orlando Magic and the Houston Rockets, Nick Anderson, a 70 percent career free throw shooter of the Orlando Magic, had four straight free throw attempts with a few seconds left to expand the team's lead of three points. He missed all four shots enabling the Houston Rockets to tie the game with a last second shot and finally win the match in overtime. Later on, the Rockets won the series in four games. Nick Anderson's free throw percentage declined significantly after this incidence to a level of 40 percent in the two seasons after that particular game.

42 During our observation period the Detroit Pistons had the highest average attendance (with 20,335 in the 2005/06 season) while the Atlanta Hawks had the smallest crowd on average (with an average of 15,026 spectators in the 2003/04 campaign). This difference is far smaller than the difference between the strong and the weak drawing teams in European football.

gets fouled while the opposing team is over the team foul limit for the quarter, or if the opponent receives a technical or flagrant foul.

Given the importance of free throws in close matches particularly during crunch-time the question arises whether players who are better able to maintain their performance level in "critical situations" benefit in terms of higher salaries. We assume that being able to avoid "choking under pressure" is a scarce talent that is particularly rewarded in the labor market. To measure an individual player's response to pressure we compare his performance from the free throw-line in crunch-time with the same player's performance during the rest of the match. Thus, our measure of "mental strength" is computed as follows[43]:

$$Mental\ Strength = \frac{Free\ Throw\ Percentage\ (Crunchtime)}{Free\ Throw\ Percentage\ (Non\ crunchtime)}$$

Thus, for players whose performance suffers under pressure we end up with a value of less than one while for those doing better (i.e. improving) in pressure situations, we have a value above one.[44]

On average, players successfully complete 77.8 percent of their free throws in pressure situations, while the respective percentage share for the rest of the time on the court is 78.6 percent. Thus, players seem to perform worse in pressure situations, but this difference is not statistically significant.[45] Since the individual players' response to pressure varies considerably (see Figure 4-1) we now take a closer look at the impact of mental strength on player remuneration.

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[43] Data on player performance under pressure were obtained from the website http://www.82games.com.

[44] We also take into account that it is harder for a good free throw shooter to improve further during crunch-time situations compared to a mediocre shooter by multiplying the respective player's improvement/decline during crunch-time by his non-crunchtime free throw percentage. This does not change any of the results presented in this chapter.

[45] If, as one might argue, a player's performance suffers due to fatigue, we should find in our data a negative correlation between our measure of "mental toughness" and the number of minutes played per game. The resulting correlation coefficient is close to zero and not statistically significant. Thus, the relative performance of players from the free throw line does not suffer from having played more minutes. Moreover, one might also expect to observe a significantly positive correlation between a player's mental strength and his minutes on the court during crunch-time. Again, our data does not support this hypothesis, because the correlation is again insignificant.

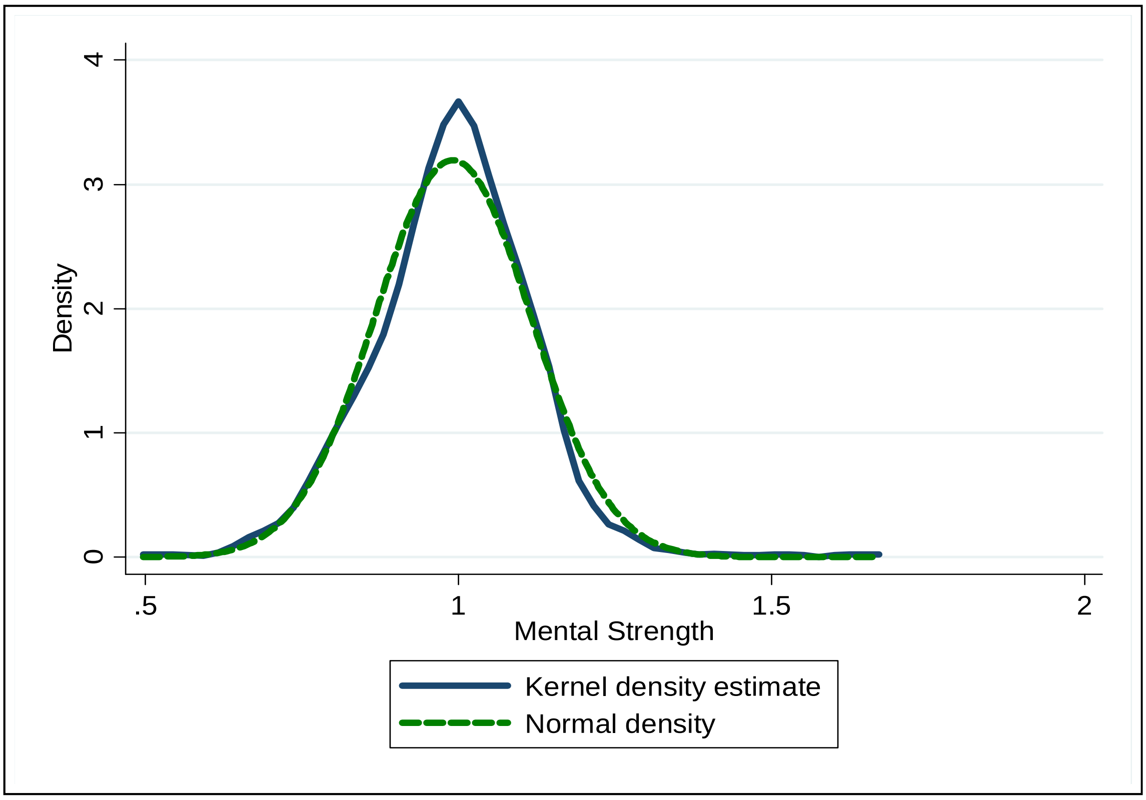

Figure 4-1: Kernel Density Estimation "Mental Strength"

4.4 Data, Estimation, and Findings

The data set analyzed in this chapter includes the standard performance statistics as well as the annual salaries of all professional basketball players who appeared in at least one regular season match in the National Basketball Association (NBA) in the period between 2003/04 and 2006/07. We start with a data set that includes 697 different players and 2,008 player-year-observations that have been compiled from all 4,879 regular season games that have been played during that period.[46] Statistics on player performance were drawn from the league's official website (http://www.nba.com), while player salaries were obtained from http://www.eskimo.com/~pbender. Our final data set includes only players who were awarded at least 15 free throw attempts during crunchtime in the 82 regular season games in the 2003/04-2006/07 seasons. This leaves us with 208 different players and 458 player-year-observations. These players were awarded a total of 147,518 free throws, of which 14,325 occurred during crunchtime.

[46] The NBA had 1,189 regular season games during the 2003/04 season and, due to the arrival of one expansion team (the Charlotte Bobcats) 1,230 games during following three seasons.

Apart from mental strength, a number of additional factors are likely to affect an individual's annual salary. As suggested by the previous literature, we control for player experience and "potential" (measured by the number of years in the NBA at the start of the respective season and the draft number). Since we expect decreasing marginal returns to experience, we also entered experience squared in our estimations. A low draft number, in turn, indicates a player of high ability, as he has been selected at an early stage of the annual recruiting event of the NBA. We therefore expect a negative influence of draft position on annual earnings (the higher the draft number, the lower the ability level and, consequently, the lower the salary). Since there are 30 teams in the NBA and each team has two picks, the highest possible draft number is 60. Players who were not selected during a draft, but still made it into the league and into our sample, were coded as pick number 61.

In addition to talent and experience a player's performance on the court is likely to have a strong impact on his remuneration. We therefore control in our estimations for the number of minutes played per match as well as the individual's performance in the offense and the defense by including, first, the number of points scored per game and, second, the non-scoring performance that we measure as follows:

$$Non\ Scoring\ Performance = \frac{Rebounds + Assists + Blocks + Steals}{Games\ Played}$$

However, since individual performance statistics might not tell the whole story, we additionally control for the impact that individual players have on their team's performance. We therefore measure the different teams' performance in defense and offense per 100 ball possessions when a particular player is either on or off the court. The variable "ONOF" measures the difference between these values and was obtained from the website http://www.82games.com.

The number of all-star appearances serves as our measure of "superstardom" and/or "fan appeal" and allows distinguishing between exceptional players and very good ones.[47] Since we expect decreasing marginal returns to the number of all-star appearances we include the squared term of that variable in our estimations too. Moreover, left-handed players might be harder to defend, since players are accustomed to defend right-handed players during practice and during the majority of the games played. One might therefore assume that left-handed players, due to their short supply, earn more than their right-handed counterparts.[48] Our data set contains twelve left-handed players who account for 35 player-year observations. Finally, an individual's ability to play on a certain position is expected to have an influence on his salary, too. We therefore control for the five positions point guard (PG), shooting guard (SG), small forward (SF), power forward (PF) and center (CE). Due to the short supply of individuals who are able to play the center position, we expect centers to be among the highest paid individuals in professional basketball. We also control for the different clubs' financial situation by including the natural log of the team wage bill in the estimations.

Table 4-1 displays the descriptive statistics of our sample. Since our sample includes only players with a minimum of 15 free throw attempts during crunch-time, we have a highly selected population of athletes who are among the highest paid in the league. The average salary is about 6.9 million dollars with a median of 5.5 million dollars.[49] Individual salaries vary from 366,931 dollars that were paid to Udonis Haslem in the 2003/04 season to 28 million dollars that went to Kevin Garnett during the same campaign.[50]

[47] Superstars have been shown to increase the public interest in a franchise and raise its market value considerably (see Hausman and Leonard 1997).

[48] Bryson, Frick and Simmons (2009) show that left-footed soccer players are paid significantly higher salaries.

[49] The average salary in our complete ("starting") sample is slightly below 3 million dollars. Moreover, the players in our final sample spend more than 32 minutes per match on the court (compared to 12 minutes in the whole sample).

[50] To account for possible discontinuous salary history and heterogeneous financial powers of the teams, season dummies (SD) as well as team dummies (TD) are included in the regression analysis.

Variable	Definition	Mean	Min.	Max.
LNTP	Natural logarithm of team payroll	17.90	16.97	18.65
EXP	Experience	5.08	0	17
EXP^2	Experience squared	35.94	0	289
DN	Draft number	19.27	1	61
DN^2	Draft number squared	716.39	1	3721
ASG	All-star game appearances	1.28	0	14
ASG^2	All-star game appearances squared	7.42	0	196
MIN	Minutes played in % of maximum minutes possible	60.95	18.36	85.19
PPG	Points scored per game	15.74	4.2	35.4
NSP	Non-scoring performance per game	8.53	3	20
ONOF	Difference in team performance if player is on court	3.0	-9.8	20.2
LH	Left-handed player (dummy; left = 1)	0.08	0	1
PG	Point guard (dummy; yes=1; reference category)	0.27	0	1
SG	Shooting guard (dummy; yes=1)	0.24	0	1
SF	Small forward (dummy; yes=1)	0.21	0	1
PF	Power forward (dummy; yes=1)	0.19	0	1
CE	Center (dummy; yes=1)	0.10	0	1
MEST	Relative performance in pressure situation	0.99	0.53	1.64

Table 4-1: Descriptive Statistics

Before presenting our estimation results we want to emphasize that *experience* and *mental strength* are not correlated. Neither the time a player has managed to survive in the NBA – a certainly highly competitive labor market – nor the time per match he is on the court have any discernible influence on “performance under pressure”. Thus, mental strength seems to be an innate skill and ability rather than a personal characteristic that can be improved upon by systematic training. We have in our sample young players who perform well under pressure as well as older players who tend to choke under stress. These findings confirm sportswriters as well as fans, both usually stating that mental toughness is an innate skill, which enables some players to respond to pressure situations better than others.

We take this result as the starting point to test our initial hypothesis stating that players, who maintain or exceed their performance level during crucial game situations, are paid better than observationally similar players who tend to choke under pressure. To estimate the impact of the aforementioned individual characteristics and performance measures on player salaries, we estimate different Mincer-type earnings functions that all have the following general form:

$$\begin{aligned}\ln Salary = \alpha_0 + \alpha_1 EXP + \alpha_2 EXP^2 + \alpha_3 DN + \alpha_4 DN^2 + \alpha_5 PPG + \alpha_6 MIN \\ + \alpha_7 NSP + \alpha_8 ASG + \alpha_9 ASG^2 + \alpha_{10} LH + \alpha_{11} TP + \alpha_{12} MEST \\ + \alpha_{13} SD + \alpha_{14} \mathrm{TD} + \varepsilon\end{aligned}$$

We admit that the models based on the equation above may suffer from an endogeneity problem, because the direction of causality between the dependent variable (*log of annual salary*) and our key independent variable (*mental strength; MEST*) is not completely clear. It may well be the case that players with higher incomes – who are financially better endowed with private wealth – are mentally stronger due to an increase in self-confidence. In order to test for potential endogeneity we performed a Durbin-Wu-Hausman test (see Hausman, 1978), which analyzes whether there is sufficient difference between the coefficients of the instrumental variables regression (2SLS) and those of the conventional OLS specification. The *Prob* $>chi^2$ statistic of our regression model ($\chi^2 = 14.36, p > .1$) clearly demonstrates that we cannot reject the null hypothesis that the OLS specification is a consistent unbiased estimator, supporting the assumption that an instrumental approach is not necessary.

Estimation results are reported in Tables 4-2 to 4-4 below. We start with our OLS model, followed by the random effects estimation and the quantile regressions. Several studies of salary determination in professional team sports use quantile regression estimation since log salary measures tend to have even greater kurtosis values than standard occupations (Hamilton 1997, Berri and Simmons 2009, Vincent and Eastman, 2009). Of course, ordinary least squares is the best linear unbiased estimator provided that the error distribution is homoscedastic. Moreover, ordinary least squares parameters tend to a normal distribution around true values even if the individual residuals are not normally distributed. The particular advantage of quantile regression is that it facilitates examination of salary returns to characteristics at different points in the salary distribution (Koenker 2005). Ordinary least square estimates constrain marginal effects of covariates to be the same at the mean and elsewhere. But in salary models, and more so in sports than in standard labor markets, the average salary is greater than the median due to excess kurtosis of the distribution. Marginal effects at the median are not necessarily the same as at the mean or anywhere else in the distribution. The presence of player outliers – the "superstars" – may well cause marginal effects of covariates, such as mental strength, to differ through the distribution. However, we have no prior on the pattern of this variation. It does appear, though, from evidence on some other North American sports, that marginal effects of covariates on player salaries do differ in magnitude, sometimes substantially, over the salary distribution (Simmons and Berri 2009, Vincent and Eastman 2009).[51]

The OLS and the RE estimations include three different models with model (1) being as close as possible to the ones that have been used in the literature so far. Models (2) and (3) differ from model (1) insofar as they both include our measure of mental strength as an additional right hand-side variable. The difference between models (2) and (3) is that the former uses points per game and non-scoring performance per game as explanatory variables while model (3) uses the "on-off" statistic as the main performance measure. The reason for replacing the more traditional performance measures by the "on-off" metric is twofold: First, individual statistics are not the only possible way to measure a players' contribution to his team's performance. Comparing the team's performance when a certain player is on the court to the team's performance when he is off the court provides an alternative measure of that player's efficiency. Second, the different estimations allow us to evaluate the robustness of our findings with respect to our key independent variable, *mental strength*.

Since the data we use is an unbalanced panel it is possible (and necessary) to exploit this additional information and account for unobserved player heterogeneity by using

[51] Presence of non-normality in the dependent variable is indicated by a large kurtosis value and in our case the D'Agostino (1990) test is performed by the sktest command in Stata 10.1. We can investigate the impacts of mental strength at any quantile of the salary distribution, not just the conditional mean. Moreover, the quantile regression approach is semi-parametric in that it avoids assumptions about the parametric distribution of the regression error term, an especially suitable feature where the data are heteroskedastic as in our case.

the random effects estimation technique. In order to select the most appropriate model we performed a Lagrange-Multiplier test (Breusch and Pagan 1980) that analyzes whether the null hypothesis that the pooled OLS model would work just as well as the random effects model is rejected or not. The Prob > chi^2 statistic of our two regression models ($\chi^2 = 12.74, p <. 01$ (Model 1) and $\chi^2 = 24.24, p < .01$ (Model 2)) clearly indicates that unobserved player heterogeneity is present which suggests that applying the random effects model is more appropriate than using the pooled OLS.[52] Nevertheless, the coefficients obtained via OLS and RE are virtually identical suggesting that the bias in the OLS-estimation resulting from unobserved heterogeneity may be negligible.

Tables 4-2 and 4-3 reveal that around 70 percent of the variation in player salaries can be explained by our set of independent variables. This is surprisingly high, as our sample includes only players whose performance is above average, i.e. who differ far less in their "glamour statistics" than those excluded from the sample. Moreover, with regard to the "standard" performance measures our results corroborate the findings that have been presented in the literature already: Earnings increase with experience, but at a decreasing rate with player incomes reaching their maximum after nine years and declining thereafter (Gius and Johnson 1998: 704, Kahn and Sherer 1988: 50, Hamilton 1997: 292, Hill 2004: 88). The draft number also has the expected influence on player salaries[53]: The earlier a player is picked out of the pool of applicants ready to join the NBA, the higher is his income (Gius and Johnson 1998: 704, Wallace 1988: 305, Hill 2004: 88). This effect, too, declines as the resulting profile exhibits a downward-sloping and convex form (Koch and Vander Hill 1988: 88, Prinz 2005: 119).

[52] Estimation of a fixed effects model is not possible, as some of the right hand side variables (such as draft number and left-handedness) are constant over time.

[53] Moreover, Staw and Hoang (1995) find that the draft number has a statistically significant impact on the individuals' playing time in the NBA.

Variable	1.1 Coefficients	2.1 Coefficients	3.1 Coefficients
LNTP	0.295 (1,54)+	0.299 (1.54)+	0.319 (1.68)*
EXP	0.348 (14.24)***	0.372 (15.08)***	0.350 (14.33)***
EXP^2	-0.018 (-9.07)***	-0.021 (-10.47)***	-0.018 (-9.22)***
DN	-0.024 (-3.83)***	-0.027 (-4.45)***	-0.025 (-3.98)***
DN^2	0.000 (1.89)*	0.000 (2.24)**	0.000 (2.06)**
ASG	0.110 (3.42)***	0.187 (6.36)***	0.112 (3.60)***
ASG^2	-0.008 (-2.34)**	-0.012 (-3.60)***	-0.008 (-2.73)***
MIN	0.000 (0.15)+	0.007 (3.14)***	0.000 (0.18)+
PPG	0.028 (4.06)***	---	0.028 (4.08)***
NSP	0.034 (2.81)***	---	0.033 (2.81)***
ONOF	---	0.007 (1.27)+	---
LH	0.220 (2.06)**	0.278 (2.48)**	0.221 (2.08)**
SG	0.123 (1.65)+	0.127 (1.79)*	0.114 (1.53)+
SF	0.075 (0.97)+	0.092 (1.17)+	0.067 (0.87)+
PF	0.035 (0.45)+	0.111 (1.47)+	0.026 (0.33)+
CE	0.400 (4.12)***	0.436 (4.57)***	0.402 (4.20)***
MEST	**---**	**0.456 (2.17)****	**0.432 (2.16)****
Season dummies	Included		
Team dummies	Included		
Const	8.51 (2.41)**	8.21 (2.26)**	7.636 (2.15)**
R^2	0.730	0.718	0.733
Number of obs	458	458	458

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance (z-values in brackets).

Table 4-2: The Impact of Mental Strength on Player Salaries (OLS-Estimation)

Apart from experience and draft number, the number of all-star appearances is also a valid measure of a player’s talent. Entering the linear as well as the squared number of all-star appearances in our estimation results in the well-known picture: First, the marginal returns to all-star appearances are decreasing and, second, the number of all-star appearances at which the income maximum is reached (the turning point) is about nine – a number that very few players ever reach (Prinz 2005: 119).

Variable	**1.2** Coefficients	**2.2** Coefficients	**3.2** Coefficients
LNTP	0.352 (2.02)**	0.371 (2.13)**	0.371 (2.14)**
EXP	0.372 (11.60)***	0.389 (12.53)***	0.374 (11.63)***
EXP^2	-0.020 (-7.65)***	-0.025 (-8.72)***	-0.020 (-7.78)***
DN	-0.030 (-3.77)***	-0.033 (-4.22)***	-0.031 (-3.91)***
DN^2	0.000 (1.74)*	0.000 (1.99)**	0.000 (1.87)*
ASG	0.116 (2.94)***	0.122 (3.25)***	0.122 (3.25)***
ASG^2	-0.007 (-1.75)*	-0.008 (-2.28)**	-0.008 (-2.28)**
MIN	0.000 (0.10)+	0.002 (1.15)+	0.000 (0.09)+
PPG	0.013 (1.67)*	---	0.012 (1.58)+
NSP	0.016 (1.05)+	---	0.017 (1.13)+
ONOF	---	0.005 (1.02)+	---
LH	0.268 (1.64)+	0.298 (1.77)*	0.274 (1.67)*
SG	0.126 (1.35)+	0.116 (1.26)+	0.117 (1.23)+
SF	0.014 (0.14)+	0.005 (0.05)+	0.002 (0.02)+
PF	0.126 (1.23)+	0.142 (1.40)+	0.101 (1.08)+
CE	0.377 (3.09)***	0.389 (3.28)***	0.383 (3.20)***
MEST	**---**	**0.427 (2.44)****	**0.407 (2.33)****
Season dummies	Included		
Team dummies	Included		
Const	7.80 (2.44)**	7.261 (2.24)**	7.052 (2.19)**
R^2	0.707	0.698	0.710
Number of obs	458	458	458

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance (z-values in brackets).

Table 4-3: The Impact of Mental Strength on Player Salaries (RE-Estimation)

Perhaps surprisingly, minutes played, points scored per game, non-scoring performance and the on-off statistic do not have pronounced effects on player salaries once unobserved heterogeneity is taken into account. This is certainly due to the fact that we have a highly selected population, where the variance in these performance measures is far lower than in the total player population.[54]

[54] This is again in line with the available literature: Using a large unbalanced panel of NBA players in the seasons 1990/91-1999/2000 with 4,072 player-year-observations, Prinz (2005: 125) finds that when controlling for other (potential) determinants of individual salaries, few of the measures of scoring and non-scoring performance are statistically significant.

Variable	0.1 Quantile	0.25 Quantile	0.5 Quantile	0.75 Quantile	0.9 Quantile
LNTP	.5993***	.3280 **	.2621 **	.1815 +	.1680 +
EXP	.4206***	.3966***	.3746***	.2972***	.2536***
EXP^2	-.0291***	-.0208***	-.0185***	-.0141***	-.0125***
DN	-.0525***	-.0034***	-.0200***	-.0164***	-.0045 +
DN^2	.0005***	.0003 **	.0001 +	.0001 +	-.0000 +
ASG	.1307***	.1373***	.0442 +	.0512 +	.0800 *
ASG^2	-.0034 +	-.0115***	-.0036 +	-.0043 +	-.0058 +
MIN	.0026 +	.0020 +	.0002 +	.0018 +	-.0031 +
PPG	.0053 +	.0158 *	.0252***	.0334***	.0271***
NSP	.0101 +	.0420 **	.0397***	.0258 **	.0311 **
LH	-.0060 +	-.2048 +	.2039 **	.3367***	-.2210 *
SG	.0499 +	.1836 *	.1382 *	.0455 +	.0670 +
SF	.0198 +	.1060 +	.1340 *	.0967 +	.0941 +
PF	.0388 +	-.0160 +	.0748 +	.0451 +	.0204 +
CE	.1307 +	.3496***	.4379***	.4205***	.3705***
MEST	**.2816 +**	**.7282*** **	**.4389 ** **	**.1547 +**	**.3352 +**
Season dummies	included				
Team dummies	included				
Const	2.892 +	6.783 **	8.483***	10.82***	11.29***
Pseudo R^2	0.527	0.523	0.490	0.467	0.426
Number of obs.	458	458	458	458	458

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance (z-values in brackets).

Table 4-4: The Impact of Mental Strength on Player Salaries (Quantile Regression)

Interestingly – and in line with the evidence from the general labor market (see e.g. Rueback, Harrington and Moffitt 2007; Denny and O'Sullivan 2007) – we find that left handed players earn significantly more than players who shoot the ball with their right hand. As only a small fraction of the players is left handed and as these players appear to be harder to defend, the short supply of that scarce talent leads to a higher remuneration of these particularly "gifted" players.

Of the four position dummies (reference category: point guard) only the coefficient for centers turned out to be statistically significant, indicating that centers earn significantly more than players at any other position on the court (see e.g. Hamilton 1997: 292, Dey

1997: 86).[55] This result is in line with Berri et al. (2005), who find that particularly tall basketball players earn significantly more than their observationally similar smaller counterparts. Finally, the log of the teams' total wage bill has a significantly positive impact on the individual players' salary, indicating that large market teams share their revenues with players and that the players on their rosters benefit to the same extent from the rich teams' "ability to pay" (Wallace 1988: 305).

We now turn to the interpretation of the coefficient that we are most interested in, our measure of "mental strength". It appears from Tables 4-2 and 4-3 above that players who are able to maintain their performance from the free throw line in "critical" game situations receive a statistically significant and economically sizeable pay premium. An increase in mental strength of one standard deviation (i.e. by about 10 percent) causes a player's annual salary to increase by about 40 percent. Thus, mental strength – a personality trait that we assume to be an innate skill that neither increases with experience nor declines as fatigue and exhaustion set in – has a pronounced effect on individual salaries. In our data, the *p*-value for the test statistic of the null hypothesis that kurtosis does not depart from the value associated with a normal distribution is 0.000 and hence our log salary data depart from normality, a result that is similar to those found in other studies of North American sports too (e.g. Berri and Simmons 2009 on NFL and Vincent and Eastman 2009 on NHL). We therefore report quantile regression estimates in Table 4-4. We find that the salary premium for mental strength is significant at 5 per cent or better only at the 0.25 and the 0.50 quantile. At the median the premium for mental strength is again estimated at about 40 percent. Thus, the quantile regression results corroborate those from the OLS and the RE estimations. Summarizing, it appears that the "median player" enjoys a significant pay rise in case of pronounced mental strength while the "marginal players" as well as the "real superstars"[56] do not benefit at all from that particular ability.

[55] Throughout, we derive percentage impacts of changes in dummy variable from coefficients as $\exp(\beta) - 1$, where β is an estimated coefficient (Halvorsen and Palmquist 1980).

[56] This term has first been used by Alan B. Krueger (2005) who analyzes the revenues generated by particularly successful rock bands and musicians.

Our finding has a number of practical implications: First, we can think of no justification to invest additional resources in mental training in professional sports with the goal of improving players' self-confidence. Since the ability to respond to pressure (something that is ubiquitous in professional sports) seems to be an innate ability that cannot be improved by training and practice and does not increase with experience, the clubs' scouts should try to identify "stress resistant" players when they are still in college. When successful, this could lead to another "moneyball" story (Lewis 2003).

4.5 Summary and Implications

In this chapter we have tried to answer the question whether the ability to maintain one's performance level "under pressure", i.e. in situations that people perceive as "stressful" is particularly rewarded by employers. Due to the deficits of the available data sets we use an unbalanced panel of players from a particular team sports industry, the NBA. Although this precludes generalization of our findings to the "real world", we are able to measure the distribution of mental toughness in the population under study. Moreover, we identify the impact of mental strength – the ability to perform well from the free throw line during "crunch-time" – on player salaries. Athletes whose performance "when it really counts" is one standard deviation above the mean of the sample are paid about 40 percent more than their observationally similar teammates.

Moreover, we find that the ability to maintain one's performance level is an innate skill that can hardly be improved by training and practice. Experienced players do not perform significantly better under pressure and tired players do not perform worse. Thus, the ability to avoid "choking under pressure" is a valuable and scarce resource that is in particularly short supply.

Since this chapter is the first to identify the impact of mental toughness on individual salaries, additional research is urgently required to either document or question the robustness of our results. First natural candidates are certainly other team sports industries like soccer or hockey as the players here very often experience similar feelings of pressure when taking penalty kicks to finally decide a match.

5 Productivity in Friendly and Hostile Environments: Empirical Evidence from the National Basketball Association.

5.1 Introduction

Recent studies have shown that the presence of spectators influences the aggressive stance as well as the performance of individuals, as shown by Charness, Rigotti and Rustichini (2007) and Dohmen (2008b), respectively. In order to categorize the impact of the audience on performance, social psychologists distinguish between the "social support hypothesis" and the "social pressure hypothesis". The social support hypothesis claims that performance of an individual increases once he is surrounded by spectators. The social pressure hypothesis however alleges the opposite, stating that individuals performance declines due to spectators expectations. Past research neglected the impact of changing audiences on the individual performance due to a change of group membership. Professional sports appear to be a fitting natural experiment as players change teams within the league between seasons and face a new home crowd after a team switch.

In the present chapter I analyze the impact of the crowd on the free throw shooting performance by professional players from the National Basketball Association, by distinguishing between performance in front of the home crowd and performance during away games. The longitudinal character of the data set enables me to analyze the influence of a change of the team between seasons on the individual players. After changing teams a player has to play in front of a new home audience during the new season which might have an impact on performance. Hence I distinguish between players who remained with their team, players who signed as free agents for new teams and players who were traded during the offseason. The main difference between being traded or signing as a free agent is the choice of a player on his new team: Players who get traded usually do not have a say on the team they get traded to, while free agents can sign with the team of their choice.[57] Results suggest that for away games, the performance is inde-

[57] Devean George, former player of the Dallas Mavericks, is one of very few players with a right to veto a trade embedded in his contract. He used this right to inhibit being traded to the New Jersey Nets in February of 2008.

pendent of a possible team change in between seasons by a player, which is not surprising since away games are virtually the same. Playing schedules are nearly the same for every team, so a player still has to play away games against practically the same teams as before. Data for home games reveals that players who get traded to a new team, compared to players who stay with their team, maintain their performance level from the free throw line. In contrast, players who sign with a new team exhibit a significantly lower performance level during home games. I conclude that only players who are able to select a new team worsen their performance due to social pressure experienced at home games, as their performance during away games is unaffected.

5.2 Literature

With this research I add a natural experiment to the literature concerning the impact of spectators on sports performance for both, individual and team sports. For Olympics Games, a home advantage has been found for Winter Olympics as well as Summer Olympics. Overall, Balmer, Nevill and Williams (2001) report a statistical significant higher winning percentage for contestants from the host country during Winter Olympics between 1908 and 1998. By examining the different events in greater detail, the authors illustrate that while some sports such as figure skating and alpine skiing provide evidence of home advantage, others like bobsled and biathlon do not. In their related work, Balmer, Nevill and Williams (2003) also analyze the home advantage for the Summer Olympics from 1896-1986. They group sports according to the impact that judges have on the outcome of the event. As one of their main results, the authors state that a highly significant home advantage can be found for events where performance was predominantly judged subjectively.

For professional team sports in the United States, studies coincidently report a home advantage, leading to more home wins than away wins under “balanced home and away schedule”, equivalent to an identical number of home and away matchups between two teams. In their works concerning the home advantage in all major leagues in the United States as well as in four levels of professional soccer in England, Pollard and Pollard (2005) show that the winning percentage for home teams in the National Basketball

Association for the relevant time period of the present data set was around 60 percent.[58] Comparing this with the numbers the authors provide for the other major league sports, one can see that it is the highest percentage. Major League Baseball reports a winning percentage of home teams of around 54 percent, while the National Hockey League and the National Football League display average home winning percentages of 55 percent and 59 percentage, respectively.[59]

These studies display the influence of the audience on regular season games, but especially in decisive playoff games the atmosphere might impact the outcome of a game even stronger: Baumeister and Steinhilber (1984) present a work concerning the performance of home teams in decisive games in professional sports. Looking at data from the National Football League as well as the National Basketball Association, they find that home teams win early playoff games rather than decisive ones. Related to the present chapter they find that players from the home team rather choke shooting free throws, as the performance from the free throw stripe declines. Using updated information a decade later, Schlenker, Philipps, Boniecki and Schlenker (1995b) find choking by home teams to be ceased for their more comprehensive data.[60] In their opinion chocking is rather associated with the anticipation of failure than the distraction of potential success, as they go in line with Baumeister and Steinhilber (1984).

Given these results for team performance, the question arises what personality traits lead to individual excelling or choking in pressure situations. Heaton and Sigall (1991) analyze which personality type is most prone to be influenced by pressure situations. Performing a laboratory experiment which includes performing a psychomotor task in front of a supportive and non supportive audiences, they find that individuals low in self-consciousness perform relatively well when they are expected to please the audience. On the other hand they choke, when there is a high chance that the audience was disappointed by the outcome. The influence of self-consciousness on performance under pressure was earlier explored by Baumeister (1984), who finds that self-conscious

[58] For more detailed results on the emergence of home court advantage in the National Basketball Association see Jones (2007) and Jones (2008).
[59] For a review and further evidence of home advantage in team sports see Nevill and Holder (1999).
[60] For a review on why supportive audience might have a positive or negative impact on performance, see Butler and Baumeister (1998).

persons are more susceptible to choking, while Brockner (1979) shows the opposite as he observes a positive significant correlation between self-consciousness and performance under pressure.

The influence of pressure on free throw shooting in basketball has been illustrated in several studies. Dandy, Brewer and Tottman (2001) show that Australian basketball players performed significantly worse in games than during practice which might indicate influence of the audience on the performance. Leith (1998) had some basketball players talking within the team about choking in pressure situations before the competition while others did not. It turned out that groups that did not discuss choking performed significantly better than groups that did. In a related study, Wang, Marchant, Morris and Gibbs (2004) let individuals perform repeated free throw shooting tasks, first without pressure and later with methods adding pressure on them. This resulted in reduced performance in pressure situation while it displays that high self-conscious persons were more likely to choke under pressure. For the National Basketball Association Deutscher, Frick and Prinz (2009) show that players receive an additional monetary reward if they are able to perform relatively well from the free throw line during pressure situations. These pressure situations are defined as being during the last five minutes of a game when neither team is ahead by more than five points.

Players are not the only individuals in professional sports whose performance is influenced by social pressure, as many studies illustrate the influence of the spectators on individuals' decision making. Garicano, Palacious-Huerta and Prendergast (2005) find proof for social pressure on behavior of individuals. Using a data set from professional soccer in Spain they show that referees lengthen the amount of stoppage time in close games when the home team is behind, while they shorten the time in close games when the home team is leading, supporting the thesis that social pressure indeed impacts individuals' behavior.[61] Similar results are presented by Sutter and Kocher (2004) as they analyze a data set from the German Bundesliga from the 2000/2001 season. They find that referees award more extra time at the end of the match when the home team is be-

[61] The problem with refereeing decisions is based on the circumstance that they result from subjective judgment (See Dawson, Dobson, Goddard and Wilson (2007) and Boyko, Boyko and Boyko (2007)).

hind. In addition there is a bias in favor of home teams in regard to the number of penalties being awarded. Dohmen (2005) comes to a very similar finding, also for the German Bundesliga for the seasons 1992/1993 to 2003/2004. He emphasizes a stronger bias toward the home team when the crowd largely consists of home team supporters. Scoppa (2008) also reports similar results for two seasons in Italy's Serie A.[62] As a main finding he reports injury time being rewarded if the home team is losing and a greater bias towards the home team if there is no running track between the field and the stance. Also working with data from Italian professional soccer, Pettersson-Lidbom and Priks (2009) compare the decision making by referees when games are played in an empty stadium to the situation when games are played in front of spectators, as some teams were punished to play in empty stadiums due to hooligan violence. The authors find that referees punish away players less harshly in these games compared to when spectators are attending. The authors show that teams play with the same level of intensity in front of spectators compared to games in empty stadiums and conclude that social pressure rather affects referees than players. In an earlier study concerning the influence of the crowd on referees Nevill, Balmer and Williams (2002) confront referees with video tapes of game situations from a Premier League game. Results show more favorable calls for the home team with crowd noise audible than when watching the videos in silent. Once more, this underlines the thesis that referees are indeed influenced by the atmosphere in the arena.

Furthermore, next to studies concerning sports, experimental research on the impact of group membership on decision making of individuals has also been done in the recent past. Eckel and Grossman (2005) show in their work how team identification impacts the willingness to cooperate. This in turn leads to a higher team output in their setting. In a related work by Charness, Rigotti and Rustichini (2007) individuals increase their aggressive stance if they have members of their group in the audience. In the Battle of the Sexes game this leads to more coordination, while in the Prisoner's Dilemma it leads to less cooperation. Supporting the assumption that social pressure might impact productivity, Mas and Moretti (2009) reveal in their empirical work that social pressure can partially internalize problems of free-riding when considering team outputs.

[62] For a recent empirical work on the referee bias toward home teams in European cup football see Dawson and Dobson (2009).

Observing performance of workers at a large supermarket chain, they find that replacing a worker with a below average permanent productivity with a worker who shows above average permanent productivity eventually increases the effort of the other workers in that same working shift.

Summarizing, the abovementioned literature analyzes the impact of audience on individuals' performance, providing support for both, the social support hypothesis as well as the social pressure hypothesis. As performance improvement as well as performance decline in front of a supportive audience has been shown by these studies, this present chapter adds to the aforementioned literature by presenting a large database to measure performance in front of changing audiences. In particular, the free throw shooting performance in the National Basketball Association is the main subject of this work as I analyze the impact of changing teams between two seasons. The chapter is organized as follows: The next section presents the data set used for the research. While section three provides the empirical results which display the impact of a change of teams on players' performance, section four concludes.

5.3 Data

To measure the impact of the crowd on players' performance from the free throw line, I analyze a data set from the National Basketball Association. It reports the outcomes of all 584,396 free throw attempts during regular season games between the 1997/1998 season and the 2006/2007 season on an individual player basis and differentiates between the performance during home games and away games. Studies concerning team sports usually pose the problem of interaction, where success of one side is also depending on the effort of the other side. Contrary, free throw shooting in basketball provides a rare situation in sports, where success of the performing player is independent of opponents' or teammates' actions. The fact that the average attendance in arenas is relatively constant throughout the league displays another advantage over other leagues since players might be influenced by the size of the attending crowd. For the given period, average home attendance in the National Basketball Association was 17,123, while 80 percent of the average home attendance was between 14,369 and 19,954. For an illustration of the average home attendance during the relevant period see Figure 5-1.

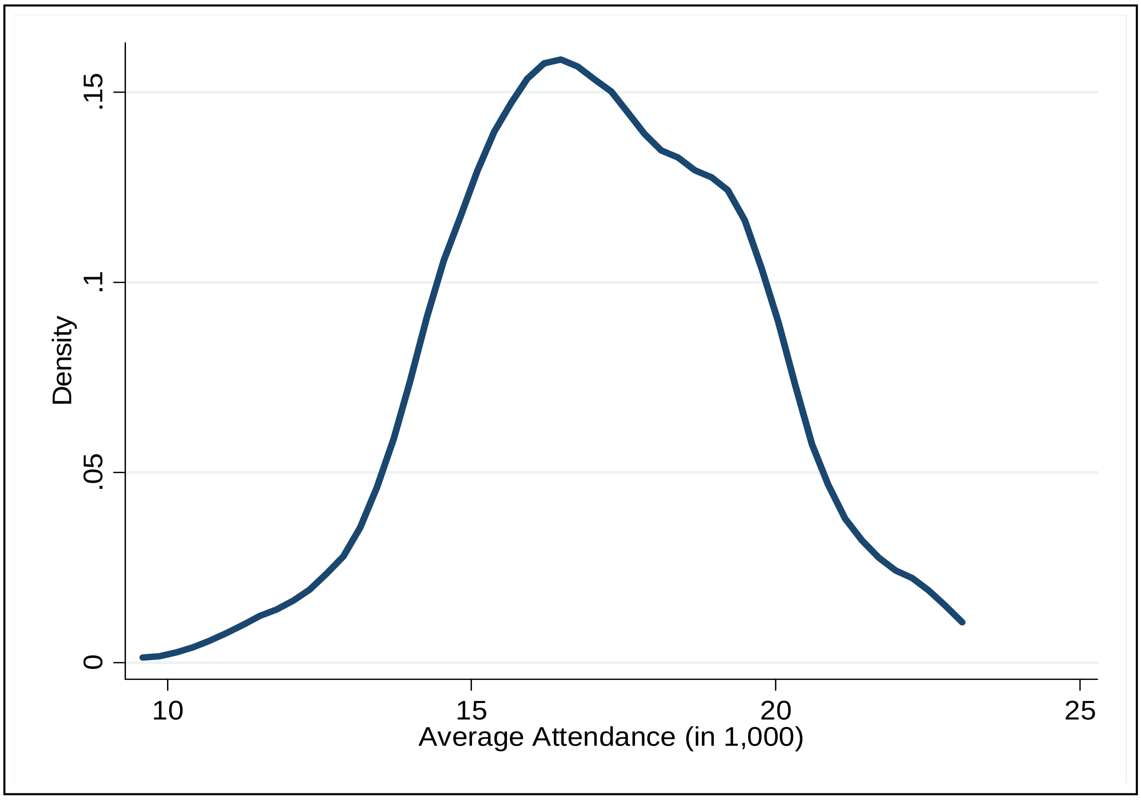

Figure 5-1: Average Home Attendance in the NBA between 1997/1998 and 2006/2007

Furthermore, the distance between the crowd and the players is virtually the same in every NBA arena, which is an additional advantage compared to games like soccer. Distinguishing between skill based performance and effort based performance, I classify basketball free throw shots to belong to the first category. The motion sequence of shooting free throws becomes increasingly automatic and less conscious due to repetition during practice. I consider the shooting procedure as skill based performance which is largely controlled by procedures outside of the working memory.[63] Baumeister (1984) notes, that skill based performance is rather influenced by pressure than effort-based performance. In addition to that, Muraven, Tice and Baumeister (1998) state that skill based performance is rather not as much subject to cognitive or physical fatigue as effort based performance. These two remarks clearly support the free throw shot as a

[63] See Anderson (1993).

feasible test subject, as it is a skill based performance which allows us to neglect the playing time of the individual player.

Analyzing the data set, I set a minimum of 10 free throw attempts for both home and away games. By doing so, I minimize the number of players who exhibit a perfect success rate due to the low number of attempts.[64] Hereby, the number of players is 630, while the data set totals in 2,675 player-year-observations and 502,317 free throw attempts, including 257,144 attempts for home teams and 245,173 for away teams. Data concerning the free throw performance has been taken from the league's official website at http://www.nba.com and http://www.basketball-reference.com. Data concerning the players' salary was obtained from Patricia Bender's webpage at http://www.eskimo.com/~pbender/. Information on the average home and away attendance in the NBA has been taken from the website of the Entertainment and Sports Programming Network at http://www.sports.espn.go.com/nba/attendance.

To measure the impact of the audience on free throw performance, I distinguish between free throw shooting percentages during home games and free throw shooting percentages during away games which allows estimating the influence of the crowd on the players' performance. The two dependent variables that I analyze in the following are the free throw percentages in a given season T, both during home games (denoted as: FT (T) Home) and during away games (denoted as: FT (T) Away). Since signing with a new team apparently is not the only explanatory variable for performance from the free throw line, I also include a number of other variables in the following regression analyses. Table 5-1 shows the descriptive statistics for the dependent as well as the independent variables used in the following estimations.

[64] Out of 2,675 player-year observations, only five players show a perfect success rate during home games, while four did not miss a single free throw during away games.

Variable	Operationalization	Mean	Min.	Max.
FT (T) Home	Free throw perc. at home games current season	0.74	0.22	1
FT (T) Away	Free throw perc. at away games current season	0.74	0.14	1
FT (T-1) Home	Free throw perc. at home games previous season	0.74	0.21	1
FT (T-1) Away	Free throw perc. at away games previous season	0.74	0.21	1
Exp	Experience	5.68	1	19
Exp^2	Squared experience	45.8	1	361
Attempts Home	Change of free throw attempts at home	1.18	0.04	14.2
Attempts Away	Change of free throw attempts at away	1.15	0.05	10.3
ln Salary	Natural logarithm of players salary	15.0	9.46	17.2
Stayer	Player remained with his old team	0.74	0	1
Trade	Player got traded before the season	0.12	0	1
Free Agent	Player signed with a new team before the season	0.14	0	1

Table 5-1: Descriptive Statistics

As the free throw routine is a task a player has to perform throughout his amateur and professional career, the free throw percentage of a particular player from the previous season should be a decent indicator to estimate his ability. Hereby, I distinguish between the previous season free throw percentages during home games (denoted as: FT (T-1) Home) and during away games (denoted as: FT (T-1) Away). As players' experience might also impact his performance and his response to social pressure, the experience is also included in the following regression analyses (denoted as: Exp). It is measured in years as a professional player in the National Basketball Association. As I also take the performance from the previous season T-1 into account, the minimum experience of the players included in the data set is one year. Since one might expect decreasing marginal returns to experience, the squared experience is included as well (denoted as: Exp^2). As the number of free throw attempts sometimes differs dramatically between two seasons, the players' performance might be subject to change due to a higher or lower number of attempted free throws and resulting in higher or lower recent experience in this particular game situation. I therefore account for an increase or decrease in attempts between the most recent season T and the previous season T-1 by dividing the number of attempts in season T by the number of attempts in season T-1.[65] Once more, I differentiate between the change in attempts during home games (denoted as: Attempts Home) and away games (denoted as: Attempts Away).[66] As players' salary might also impact the pressure put upon a player it is also included as an independent variable. Since Figure 5-2 clearly shows a right-skewed distribution of players' salary, the natural logarithm of the salary is included in the following analyses (denoted as: ln Salary).

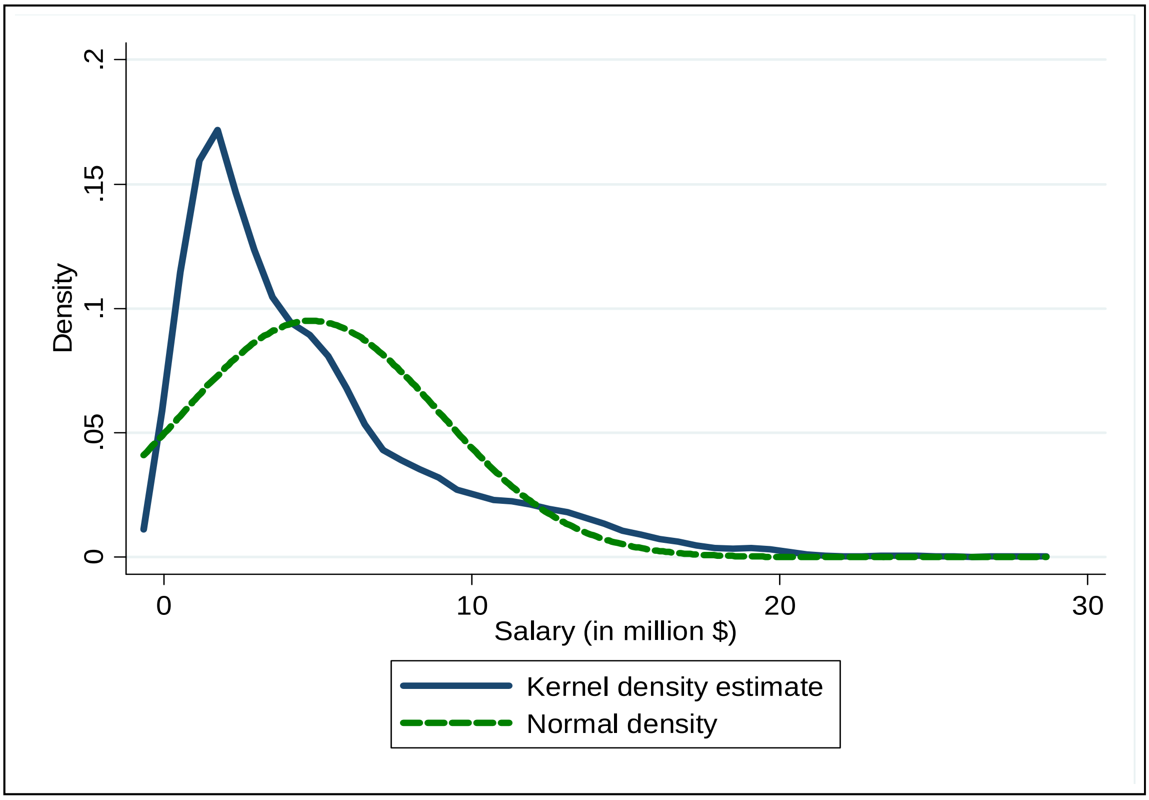

Figure 5-2: Kernel Density Estimation of the Salary in the NBA

Since the aim of this chapter is to measure the effect of playing for a new team on the players' performance, I distinguish between three different situations a player might

[65] If the number of free throw attempts is the same in T as in T-1, the variable has a value of one. Due to the lockout in 1998/1999, the number of regular season games was reduced from 82 to 50 in this particular season. I weigh the number of free throws attempted and free throws made for this particular season by the factor 1.64.

[66] The apparently low numbers of 0.04 and 0.05 result from Orlando's Grant Hills' injury during the 2000/2001 season and the resulting decline of attempts in that particular year. The maximum values display the vast increment of Gerald Wallaces' playing time after being picked by Charlotte during the expansion draft in 2004 and the return of Miami's Alonzo Mourning in 2001/2002 after an injury during the previous season.

face in season T. The first and most common situation is that a player still plays for the team he has already played for it in the previous season T-1. 74 percent of the players in the data set remained with their teams (denoted as: Stayer). The second situation, switching teams between season T-1 and season T, can be subdivided into two possible events: A player either gets traded by his former team to another team (denoted as: Trade) or he signs with the team of his choice as a free agent (denoted as: Free Agent). Since also the contract of a player gets traded between season T-1 and T, any player who is traded at least has to have a valid contract for season T and does not have a choice on the team he gets traded to. A player who signs as a free agent does not have a running contract for season T and is free to sign with a team of his choice after season T-1. In the present data set, 12 percent of the players are traded between seasons, while 14 percent of the players sign as free agents with a new team. A player who has signed as a free agent with his old team is also denoted as being a Stayer, since the home crowd he is playing in front of is the same in season T as it has been in season T-1.

5.4 Empirical Results

The main purpose of this section is to determine what impacts the players' performance from the free throw line during home and away games. I particularly want to determine the impact of the audience on the performance as some players change teams between two seasons while others do not. The data set shows that 184,856 out of 245,173 attempted free throw during away games were successful, which equals a success rate of 75.40 percent. During home games, 194,736 of 257,144 free throws attempts were made, equivalent to a success rate of 75.73 percent. Applying a simple t-test while controlling for the number of attempts by the players, this difference proves to be insignificant (t=0.1657+). While cumulated performance shows that players on average hit three out of four free throws, individual performances range between a 26.2 and 98.8 percent success rate. Kernel density estimations for players' free throw percentages are shown in Figure 5-3, again distinguishing between free throw success during home and free throw success during away games and supporting the finding that individual performance indeed differs between players.

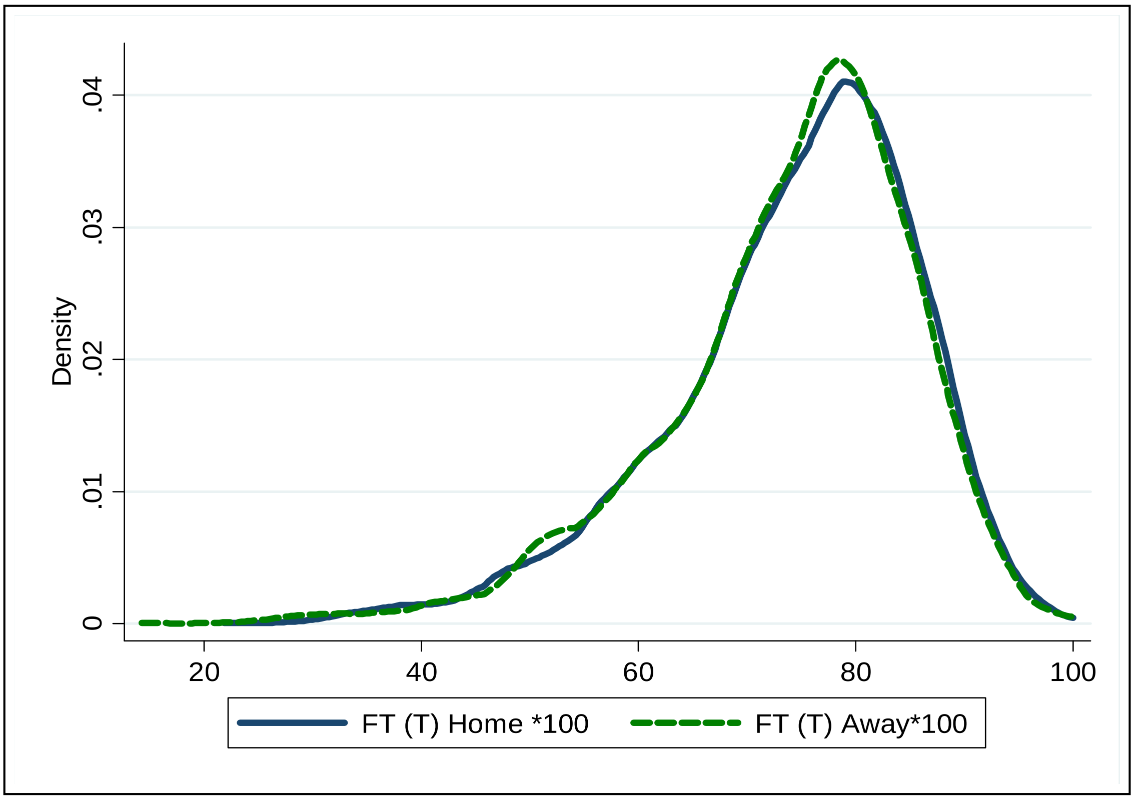

Figure 5-3: Kernel Density Estimation of Free Throw Success during Home and Away Games

Even though it might be seen as a bit disappointing that performance appears to be independent of playing at home or away, I go on by running four regression analyses on individual player basis to estimate the impact of the variables introduced in the previous section on free throw success during home and away games in season T, which are the dependent variables. I suggest the two equations to look as follows:

$$\text{FT (T) Home} = \alpha_0 + \alpha_1 FT\ (T-1)\ Home + \alpha_2 Attempts\ (Home) + \alpha_3 Exp + \alpha_4 Exp^{\,2} + \alpha_5 \ln\ Salary + \alpha_6 Stayer + \alpha_7 Trade + \alpha_8 Free\ Agent + \varepsilon$$

$$\text{FT (T) Away} = \alpha_0 + \alpha_1 FT\ (T-1)\ Away + \alpha_2 Attempts\ (Away) + \alpha_3 Exp + \alpha_4 Exp^{\,2} + \alpha_5 \ln\ Salary + \alpha_6 Stayer + \alpha_7 Trade + \alpha_8 Free\ Agent + \varepsilon$$

Due to the panel characteristics of the data it is possible to account for some unobserved player specific characteristics via the random effects estimation technique. Hence, next to the conventional OLS specification two random effects models are run.[67] Estimations of both models are reported in Table 5-2, where the results of the regression analyses are shown for home games (Model 1) and away games (Model 2).[68]

	Home (Model 1)		**Away (Model 2)**	
	Coefficients		Coefficients	
Variable	**OLS**	**RE**	**OLS**	**RE**
FT (T-1)	0.679 (45.10)***	0.442 (24.23)***	0.653 (41.82)***	0.424 (22.95)***
Attempts	0.010 (5.74)***	0.009 (5.61)***	0.014 (7.16)***	0.013 (6.71)***
Exp	0.000 (0.48)+	0.000 (1.25)+	0.000 (0.52)+	0.000 (1.27)+
Exp²	-0.000 (-0.14)+	-0.000 (-0.76)+	-0.000 (-0.25)+	-0.000 (-0.92)+
ln Salary	-0.001 (-0.47)+	-0.001 (-0.29)+	0.002 (0.89)+	0.002 (0.76)+
Trade	**-0.005 (-0.88)+**	**-0.004 (-0.81)+**	**-0.006 (-1.21)+**	**-0.008 (-1.49)+**
Free Agent	**-0.017 (-3.11)*** **	**-0.017 (-3.32)*** **	**-0.004 (-0.75)+**	**-0.005 (-0.93)+**
Adj R^2	0.439	0.438	0.406	0.405
Observations	2675	2675	2675	2675

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance.

Table 5-2: Determinants of Free Throw Shooting Success in the NBA

Already introduced in the previous section, the main concern of this work is the impact of the audience on the performance of the players. Observing the results from the regression analyses, the performance from the free throw line during the previous season T-1, separately reported for home and away games, has a highly significant positive impact on the performance during the most recent season T. This is not very surprising, since the free throw shot is a standardized situation, practiced at a high volume. Hence, the assumption that prior performance is a good indicator for the ability to shoot free

67 Even though the Hausman-test suggests performing a fixed effects model, I prefer to present the random effects model, as robustness checks support the results presented in Table 5-2. Furthermore, fixed effects results are not very convincing, as they suggest no significant impact of the free throw performance from the previous season on the most recent performance. This appears to be odd, since the correlation between FT (T-1) Home and FT (T) is 0.6574 for home games and 0.6276 for away games, respectively. Furthermore, applying fixed effects models for Model 1 and Model 2 does not impact the significant levels of the Free Agent variables.

68 As Wallace, Baumeister and Vohs (2005) note, not all audiences show the same type of support for players and hence some home audiences might put more pressure on players than others. Including data on average home and away attendance does not impact the significance level of any other variable. Including team dummies to control for the intenseness of the atmosphere in the different arenas does not affect them either.

throws is supported by the regression analyses. Likewise, the change of free throw attempts during home and away games in season T compared to season T-1 has a significantly positive impact, meaning that shooting more free throws increases the success rate of a player. While these variables, depicting recent experience during games have a positive impact on the shooting percentage, experience measured as seasons in the NBA, does not.[69] A possible explanation for this is the fact that players have already faced pressure situations during their basketball career prior to playing in the NBA, as college games as well as games in Europe attract a similar number of spectators.[70] Since the players' income might put additional pressure on him, the natural logarithm of the salary is included as a control variable in the analyses, showing that it has no impact on the performance.

To answer the main research question of this chapter one has to look at the key independent variables, denoting the change of teams between season T-1 and season T. For the regression analyses, the players who remain with their teams (denoted as: stayers) serve as the reference group. Compared to those, neither players who were traded nor players who sign as free agents with a new team perform significantly different during away games. This does not surprise, since away games are basically the same as in the previous season, except for those for the old and the new team. On the other hand, the free throw shooting performance during home games is clearly influenced by the change of teams during the offseason. Compared to the players who stay with their team, players who are traded to a new team do not show a significantly different performance. This result can be justified by the fact that players commonly do not have a say on the team that they are traded to, which consequently does not create additional pressure on them. Taking a look at players who signed as free agents before the start of the new season, the results show that those perform significantly worse during home games compared to players who stayed with their old team. As a main result of this chapter, I conclude that social pressure, generated by selecting a new supporting audience due to signing with the team as a free agent, leads to a reduction in performance.

[69] Running the regression analyses without the variable Attempts does not change the significance level of any other variable.

[70] This result goes in line with a finding in the previous chapter. In chapter four we show that experience does not increase players' ability to remain their performance level during crucial game situations.

Furthermore, one might be interested whose performance suffers most under social pressure, targeting the question if rather good or bad free throw shooters are influenced by a changing home audience. Several laboratory experiments analyze the impact of distraction on performance by novices and experienced players in sports. These appear to be comparable to the quantile regressions in this chapter, as they analyze how individuals of different skill levels respond to pressure situations. They coincidently find that distraction from a main task hurts performance of novices more than it hurts performance by experts. Leavitt (1979) was the first to support this hypothesis by demonstrating how speed skating by novices, while stick handling through pylons, was significantly slowed down under dual-task condition, while this result does not hold for experts. Studies by Beilock, Carr, MacMahon and Starkes (2002) and Gray (2004) support this finding as they study the performance on soccer dribbling and baseball batting, respectively. Coincidently, they find experts to be significantly less prone to distraction than novices.

As the present data set only includes professionals one can distinguish between different levels of free throw shooting within the cohort. Performing quantile regressions for home and away free throw performances serves as a decent tool to answer the question if rather good or rather bad shooters suffer from playing for a new team. Results are presented in Table 5-3 for home games and in Table 5-4 for away games. One can see that the results for the quantile regressions (.10, .25, .50, .75, .90 quantile) are pretty similar to the OLS and random effects results presented in Table 5-2 for most variables. Bearing in mind that players who signed as free agents prior to the season perform significantly worse during home games one might be interested if rather good or rather bad free throw shooters at home games are affected by playing in front of a new home audience. Table 5-3 illustrated that only comparably bad shooters, belonging to the .1, .25 or .5 percentile, are affected negatively by the new audience, as the performance of players belonging to the .75 and .9 percentile remains unchanged. Performance during away games is again independent of changing teams between seasons.

Variable	.1 Quantile	.25 Quantile	.5 Quantile	.75 Quantile	.9 Quantile
FT (T-1)	.8414***	.7971***	.7118***	.6020***	.4298***
Attempts	.0121***	.0128***	.0102***	.0049***	.0002 +
Exp	-.0042 +	-.0029 +	-.0003 +	.0026 +	.0048 *
Exp^2	.0002 +	.0002 +	.0000 +	-.0001 +	-.0002 +
ln Salary	.0158***	.0065***	-.0010 +	-.0043 **	-.0123***
Trade	**-.0198 +**	**-.0068 +**	**.0008 +**	**-.0004 +**	**-.0048 +**
Free Agent	**-.0287 ****	**-.0240*****	**-.0116 ****	**-.0064 +**	**-.0045 +**
Pseudo R^2	.3146	.3052	.2644	.2150	.1689
N of Cases	72675	2675	2675	2675	2675
Raw Sum of Dev.	127.7	210.7	234.9	168.0	85.6
Min Sum of Dev.	87.5	146.4	172.8	131.8	71.1

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance.

Table 5-3: Quantile Regression of Free Throw Success during Home Games (Model 1)

Variable	.1 Quantile	.25 Quantile	.5 Quantile	.75 Quantile	.9 Quantile
FT (T-1)	.7974***	.7727***	.6665***	.5766***	.4603***
Attempts	.0193***	.0143***	.0118***	.0082***	.0026 +
Exp	-.0021 +	-.0013 +	.0008 +	.0029 +	.0040 +
Exp^2	.0000 +	.0000 +	-.0000 +	-.0001 +	-.0001 +
ln Salary	.0208***	.0082***	.0037 +	-.0076***	-.0129***
Trade	**-.0143 +**	**-.0140 ****	**-.0016 +**	**-.0143 +**	**-.0095 +**
Free Agent	**-.0120 +**	**-.0078 +**	**.0074 +**	**-.0040 +**	**-.0067 +**
Pseudo R^2	.2841	.2736	.2357	.2011	.1663
N of Cases	2675	2675	2675	2675	2675
Raw Sum of Dev.	129.4	211.4	232.9	166.4	84.8
Min Sum of Dev.	92.6	153.4	178.0	132.9	70.7

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance.

Table 5-4: Quantile Regression of Free Throw Success during Away Games (Model 2)

5.5 Conclusion and Future Research

This chapter presents an empirical work about the effect of performing in front of supportive audiences, focusing on the effect of changing teams and supportive audiences between two seasons. Observing data of free throw shooting in the National Basketball Association, the outcome is contrary to studies which are based on outcomes of interaction, as I do not find reduced performance in away games on an aggregated level. Due to the panel characteristic, the data provides the possibility to test how individuals respond to changing audiences. The key result presented in this chapter shows that players who changed teams after free agency suffer decline of performance at home games compared to those who stay with their old team or are traded. Therefore, I conclude that the possibility to select the team to play for by oneself has a negative impact on the performance during home games as players feel additional pressure during the following season. By performing quantile regression it has been shown that especially bad free throw shooters suffer from facing this additional pressure, while good free throw shooters performance does not decline after signing as a free agent with a new team.

Future research might take a look at the impact of trading a player within the season. Players are allowed to be traded from one team to another up until the end of February, so one might want to analyze the impact of changing teams within the season. Since decent players rarely sign within the season, the control group would be players who were not traded within the season. Further future research might subdivide the stayers into two groups: Players with a running contract and players who resigned as free agents with their old team. There might be problems with the implementation, since players sometimes sign extensions of the contract long before the old contract runs out. Still, this data might provide further insights on the impact of the audience on players. Another future research question could go in line with Baumeister and Steinhilber (1984) and Schlenker, Philipps, Boniecki and Schlenker (1995) to analyze if free throw performance of players from the home team suffers in decisive playoff games if they joined the team as free agents prior to the season. Especially, since the results from the aforementioned papers contradict, this research would shed more light on the individual impact of social pressure on individuals.

6 Cut-off Dates and Their Effect on Player Selection, Salaries and Hazard Rates in the German Bundesliga

6.1 Introduction

The implementation of cut-off dates is said to have a severe impact on the personal development of the affected individuals. Grouping children according to the date of their birth leads to a high difference in relative age between the oldest and the youngest of the relevant cohort. The relative age difference between a child who just turned six years old and another who is close to his seventh birthday is around 15 percent. In German soccer the cut-off date is 1st of August for all youth leagues. One possible effect of introducing a cut-off date is a selection bias, favoring children born shortly after this cut-off date as they have a physical advantage over the children born afterwards, who are nevertheless put into the same age cohort. Once these children reach the age which enables them to become professionals, this in turn would lead to an overrepresentation of German players in the Bundesliga who were born shortly after the cut-off date. Furthermore, as previous studies show, players who were among the youngest in their cohort and still managed to make it to the professional level earn a wage premium. This might be seen as a surprise, as the market for soccer players should only take performance into account which is relevant for the output of players and this would certainly not include the players' birth date. In addition, market efficiency would not lead to different hazard rates for different birth dates if players' performance is indeed independent of birth dates. This article tries to shed light on aforementioned possible impacts of cut-off dates on player selection and player salary in the German Bundesliga. It goes in line with a big body of literature, which analyzes the effect of cut-off dates and the relative age effect in education and sports.

In regard to education, research results are ambiguous. Jinks (1964) is among the first to find evidence for a better school performance of children who are born within the first six months of the school year, compared to peers who are born in the second half of the school year. Closely related, Pidgeon (1965) points out that while children born in the later month of the school year score higher points in intelligence tests, they later perform comparatively badly due to their disadvantageous date of birth. In a study covering a wide range of countries, Bedard and Dhuey (2006) analyze long-run effects of cut-off dates. They find a persistence of better school performance by children who belong to the oldest of their cohort for the course of their school career. In a recent study, Billardi and Pellizzari (2008) find contrary results for students at an Italian university, as they show that the younger students of a cohort perform better than their older counterparts.[71]

Angrist and Krueger (1991) were the first to study the impact of cut-off dates on the end of school careers at compulsory schooling. They argue that children born shortly after the cut-off date start school at an older age and hence are allowed to drop out after less school years than their younger counterparts. Plug (2001) finds that this leads to an increase in the probability of receiving a university degree by 12 to 16 percent for children who are born shortly after the cut-off date and hence are the oldest in their cohort.

With regard to professional sports, Barnsley, Thompson and Barnsley (1985) were the first to discover the relative age effect, as they observed that a disproportionally high number of hockey players in Canada were born in the first three months after the cut-off date.[72] In a more recent study by Baker and Logan (2007), the authors show that the relative age plays a role at the annual NHL draft. Furthermore, Barnsley, Thompson and Legault (1992) find additional evidence of the relative age effect analyzing the rosters of national teams in the 1990 soccer world cup as well as two soccer youth world tournaments. In a related work, Helsen, Van Winckel and Williams (2005) examine the relative age effect for a number of European national youth teams playing at international tournaments. Analyzing a total of more than 2000 players, they find a highly significant effect for nearly all teams, resulting in an overrepresentation of players who were born shortly after the cut-off date. Musch and Hay (1999) find cross-cultural evidence for a selection bias of players’ born shortly after the cut-off date as they analyze data from professional soccer leagues located on different continents. In addition, they observe a

[71] See Fertig and Kluve (2005), Puhani and Weber (2007) and Puhani and Mühlenweg (2010) for analyses of educational outcomes from Germany.

[72] See Boucher and Mutimer (1994) for a review of the early literature regarding the impact of cut-off date in professional sports.

shifted peak in the distribution of the birthdays of Australian players once the cut-off date changed. Verhulst (1992) observes cross-country data on professional soccer players in Europe to also find a relative age effect for the professional leagues in the Netherlands, Belgium and France. Dudink (1994) observes a skewed distribution of the birth dates in Dutch youth tennis leagues as well as in the Premier League and the first three divisions in British professional soccer.

Concerning the player numeration, a number of papers using data from different European soccer leagues analyze the determinants which help explain the players' salary.[73] For the German Bundesliga, Lehmann and Weigand (1999) as well as Lehmann (2000) were among the first to determine influencing factors of players' salary in the Bundesliga. Both studies use data from one season, as they also take into account the players origin as well as the performance of their team. Being the first to use longitudinal data, Huebl and Swieter (2002) and Frick (2007a) support the human capital theory, as they find positive, yet decreasing impact of several variables depicting players' experience.[74]

As hazard rates in the Bundesliga are going to be discussed in the following work, a short overview of the existing literature seems to be appropriate. Frick, Pietzner and Prinz (2007) are to my best knowledge the only authors who analyze hazard rates in the Bundesliga. They investigate the influence of individual performance indicators and players' origin on the probability to remain in the league. Analyzing the careers of all players who played in the Bundesliga between the season 1963/64 and 2002/03, they find evidence of the position of players as well as their age and experience impacting the probability of staying in the league. Further studies on hazard rates in professional sports include careers of Japanese baseball players by Ohkusa (2001) as well as Kura and Matsuzawa (2006).

For studies about American professional sport leagues Atkinson and Tschirhart (1986) analyze which determinants influence players' careers in the National Football League, while in their work concerning matching models, Chapman and Southwick (1991)

[73] See Frick (2007b) for an overview.

[74] For similar studies concerning other European leagues see Garcia-del-Barrio and Pujol (2005, 2006) and Lucifora and Simmons (2003).

address the hazard rates for American baseball players. In a more recent study Dilger and Prinz (2004) show that players from the National Basketball Association have to leave the league rather due to poor performance than on a voluntarily basis.[75] To conclude, a growing body of literature has developed during the last years, displaying the interest of economics in player remuneration and career tracks in professional sports.

The present chapter combines the field of analyzing the impact of cut-off dates on players' careers as well as on their salary determination. It is organized as follows: The next section presents the data while the birth-distribution of German players in the Bundesliga is presented in section 3. Section four contains the salary determination of the soccer players. Hazard rates in the Bundesliga are presented in section five and section six concludes the chapter.

6.2 Data

Analyzing the impact of the implementation of cut-off dates on players' career perspective and players' salary is the main subject of this chapter. The data set that I analyze in this chapter contains individual statistics as well as approximated salaries of 2011 players who played in the German Bundesliga between the 1995/96 and the 2007/08 season and totals in 6146 player-year-observations.[76] To my knowledge this is the first longitudinal analysis run with such a large number of observed seasons, as previous studies include a time frame of at most two seasons. Individual players' performance and statistics were obtained from the yearly published special issue of the "Kicker Sportmagazin". During the course of the relevant period the cut-off date in German youth leagues was 1st of August. Since one has to assume that only players born in Germany were subject to this rule and following Musch and Hay (1999), the number of observed players decreases to 1090. Consequently the number of player-year-observations decreases to 3550.

[75] Further studies concerning hazard rates in the NBA include Staw and Hoang (1995) as well as Hoang and Rascher (1999).

[76] To explain the number of players, which differentiates from chapter 2 and 8, one should note that this chapter was written with big timely distance and using a then up-to-date data set.

6.3 Birth-Distribution in the Bundesliga

Following Ashworth and Heyndels (2007), I will initially take a look at a possible selection bias of German players entering the Bundesliga. The reasoning behind such a selection bias is as follows: Due to their physical predominance over the later born members of the cohort, adolescent soccer players who are born shortly after the cut-off date are rather labeled as talents and hence receive stronger support. In other words, the youngest players of the cohort are easily overlooked in favor of their older counterparts.[77] Looking at the distribution of players' birth dates in Table 6-1 one can see that over 29 percent of the German players in the Bundesliga are born in the first three months after the cut-off date and hence between 1st of August and 31st of October. Furthermore, 55 percent of the players are born in the first half of the year following this date which includes 1st of August to 30th of January. Since the data set includes the precise birth date of every player one can compare it to the birth dates in the population. Following Barnsley, Thompson and Legault (1992) in assuming an equal distribution of birth throughout the course of the year, one would expect the players to be born, on average, 182 days after the cut-off date 1st of August. The 1090 players in the sample are born, on average, 170 days after 1st of August. Applying a simple t-test, one can see that this difference proves to be highly significant (t=-4.76).

	Players	**Fraction**	**Cumulated**
1st Quarter	317	0.291	0.291
2nd Quarter	282	0.259	0.550
3rd Quarter	247	0.227	0.776
4th Quarter	244	0.224	1.000

Table 6-1: Distribution of German Players' Birth Dates in the Bundesliga

[77] Helsen, Starkes and Van Winckel (1999) find that youth players born shortly after the cut-off date are identified as being talented by their coaches with a higher probability than their peers. Helsen, Starkes and Van Winckel (2000) furthermore show for the Belgian youth soccer that a change of the cut-off date immediately changed the distribution of players' birth in teams for the following season. In a study of the Olympic Development Program for youth soccer players in United States, Glamser and Vincent (2004) find a disproportional high number of players born in the first half of the year after the cut-off date.

The above shown results go in line with Allen and Barnsley (1993), even though the impact of the cut-off date in Canadian hockey seems to be more drastic. After showing the expected selection bias, I proceed by estimating the influence of the players' birth date on their salary.

6.4 Salary Determinations in the Bundesliga

Concerning the influence of the players' birth date on salary one is confronted with the thesis by Ashworth and Heyndels (2007), who claim that late born players receive a wage premium when they achieve to play in the Bundesliga. They explain this thesis by stating that everything else equal, these players are more productive and hence earn more money. In the following, I will show that including goals as a performance parameter in my data set also supports the salary bias in favor of late born players while differentiating between recent career performance and experience revokes the impact of the birth date on players' salary.[78] Before looking at the detailed results I will start by presenting the data set.

The players' salary is approximated by the data from the "Kicker Managerspiel", which is run every year. Before the season, every player is assigned a value for this virtual management game. Comparing these player values with information available from the licensing procedure by the Deutsche Fußball Liga (DFL), one finds that these values are very good estimators for players' salary in season t which are approximated as follows:

$$Players'salary\ (t) = \frac{Players'salary\ at\ kicker -\ management\ game\ (t)}{1.5}$$

Before giving information on which individual player characteristics and performance indicators might impact the salary, I start by presenting the salary structure of German players in the Bundesliga. As one can see in Figure 6-1 the average salary nearly doubled in the observed period, increasing from 513,327 Euro in 1995/1996, to

[78] This goes in line with the finding of Du, Gao and Levi (2008). They show that, after controlling for relevant information like firm performance and size, the season of birth of CEOs of S&P 500 companies has no impact on their compensation.

1,062,903 Euro in 2006/2007. This rapidly increased salary suggests that season dummies should be included in the following salary regression.

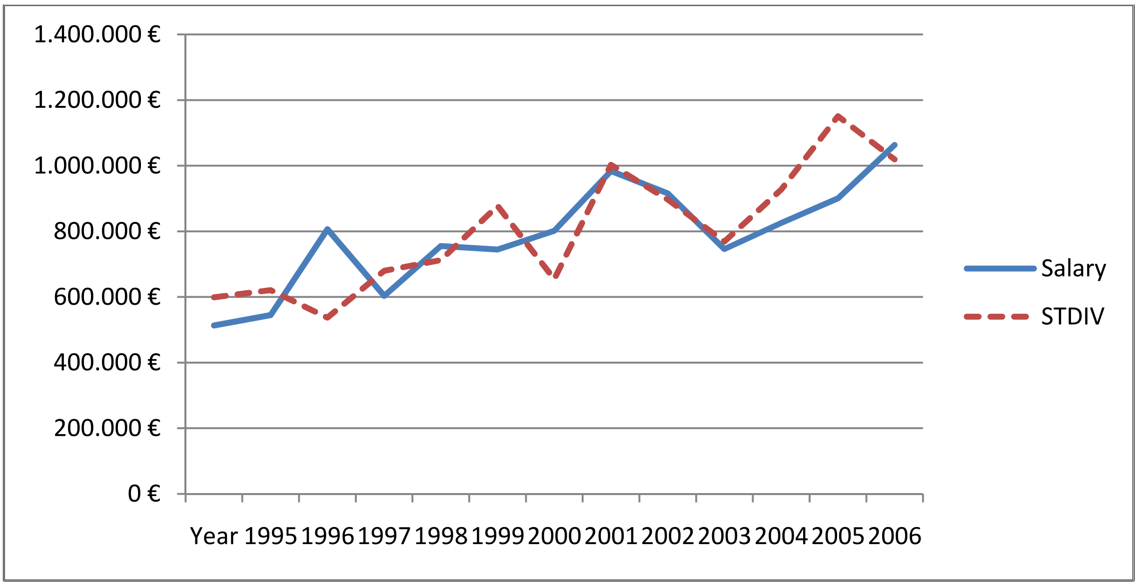

Figure 6-1: Salary History of German Players in the German Bundesliga

While individual player salaries range between 17,043 and 10,000,000 Euro per year, one observes a right-skewed distribution of players' salary as the medium salary in the Bundesliga is 769,208 Euro. Looking at the salaries subject to the quarter the players were born in, one observes the highest average salary for players born in the fourth quarter (839,694 Euro) and the lowest for players born in the third quarter (707,889 Euro). The distribution of players' salary subject to their birth date is shown in Figure 6-2. As there is obviously is no normal distribution of the players' salary, the following salary regressions are performed using the natural logarithm of the salary.

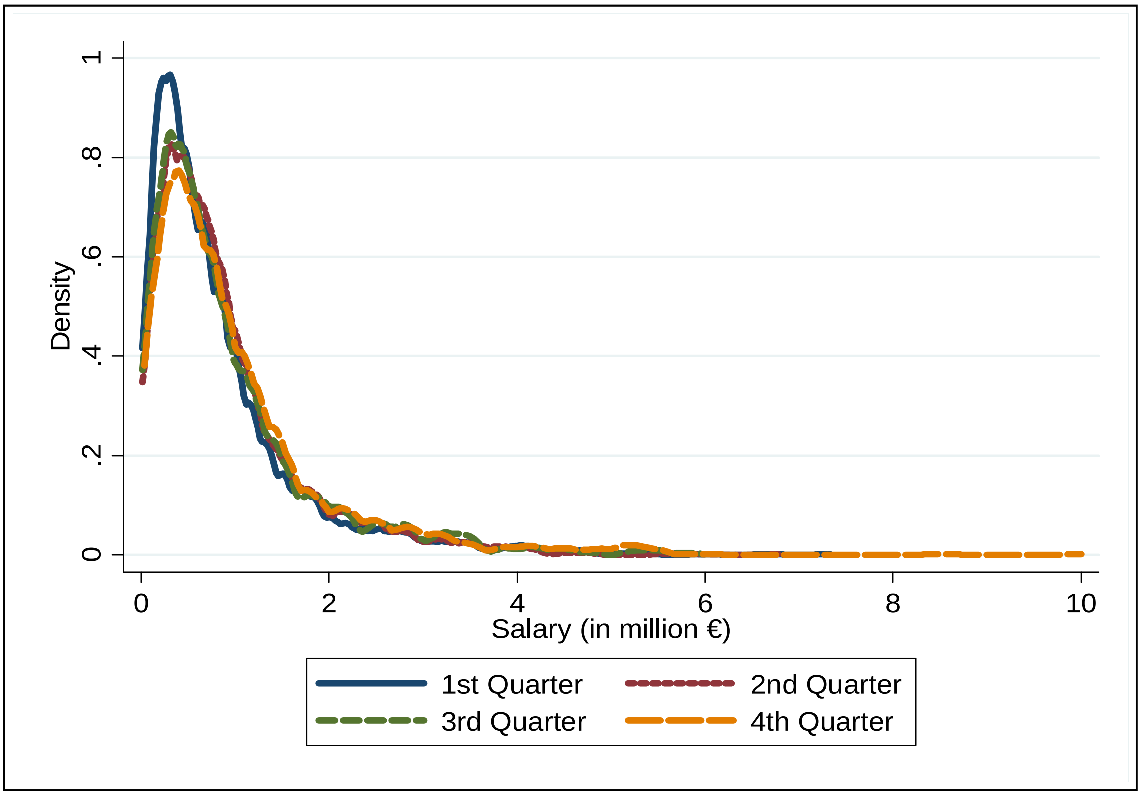

Figure 6-2: Kernel Density Estimation of Players' Salary Subject to the Quarter of Birth

In order to perform the salary estimation and to measure the effect of birth dates on the salary a variety of other factors have to be considered, which also explain the variation in players' payoff. To begin with the differentiation between the players' position on the field, I distinguish between goalkeepers, defenders, midfielders and forwards. As human capital suggests that experience increases productivity, even though with decreasing marginal returns, I introduce several parameters which depict experience. I control for players' age at the start of the particular Bundesliga season as well as for the squared age, expecting an upward-sloping and concave age-earnings profile. For the other experience indicators, I distinguish between recent and career experience: Games played in the Bundesliga also serves as a good indicator for experience. In line with the age variable, I also include the squared number of Bundesliga games, expecting decreasing marginal returns. Experience in international matches serves as the third and final experience indicator and the squared number is included once again. Finally, goals scored in the Bundesliga serve as an indicator for offensive performance by players. Following Lucifora and Simmons (2003), I distinguish between recent and career performance. Therefore, I run a second salary regression, in which I differentiate between the aforementioned players' experience and performance indicators observed in the previous season (labeled as: t-1) and the cumulated performance before the previous season (labeled as: prior t-1).

To measure the impact of the birth date on the salary of the player, the variable Birthday is introduced, denoting the number of days the respective player is born after the cut-off date 1st of August. Descriptive statistics of the experience and performance indicators are presented in Table 6-2.

Variable	Operationalization	Mean	Min.	Max.
Goalkeeper	Goalkeeper (Dummy; 1 =yes)	0.14	0	1
Defender	Defender (Dummy; 1 =yes)	0.30	0	1
Midfielder	Midfielder (Dummy; =yes)	0.38	0	1
Forward	Forward (Dummy; 1 =yes)	0.18	0	1
AGE	Age at the beginning of the season	24.2	17	41
AGE^2	Squa. age at the beginning of the season	604	289	1681
GP BL	Career Bundesliga games	69.2	0	540
GP BL^2	Squa. Bundesliga career games	12155	0	291600
GP INT	Career international games	8.97	0	137
GP INT^2	Squa. career international games	418	0	18769
GS	Career goals	7.93	0	182
GP BL (t-1)	Bundesliga games (previous season)	14.9	0	34
GP BL $(t-1)^2$	Squa. Bundesliga games (previous season)	376.82	0	1156
GP BL (prior t-1)	Bundesliga games prior to previous season	54.3	0	512
GP BL (prior $t-1)^2$	Squa. Bundesliga games prior to previous season	9389	0	262144
GP INT (t-1)	International games in previous season	1.43	0	25
GP INT $(t-1)^2$	Squa. international games in previous season	11.5	0	625
GP INT (prior t-1)	International games prior to previous season	7.54	0	130
GP INT (prior $t-1)^2$	Squa. international games prior to previous season	331	0	16900
GS (t-1)	Goals in previous season	1.63	0	28
GS (prior t-1)	Goals prior to previous season	6.34	0	171
Birthday	Days born after the cut-off date	175	0	365

Table 6-2: Descriptive Statistics of Player Characteristics and Performance Indicators

Season dummies (SD) and team dummies (TD) are included in all regression analyses to account for further influencing factors. As shown above, the inclusion of season dummies appears to be reasonable. As teams in the Bundesliga exhibit differences in financial power, team dummies are also included in the salary regressions.

In order to estimate the impact of the date of birth on the players' salary, the time gap between the respective birthday and the cut-off date is included in the salary regression. Different regression analyses are run, which include experience as well as performance indicators described above. Next to performing a salary regression which refers to total experience and performance, a second model is run in which I distinguish between recent and career experience and performance. On basis of the standard Mincer wage equation (1974) the following equation of players' salary is suggested:

$$\begin{aligned} \ln Salary = {} & \alpha_0 + \alpha_1 Defender + \alpha_2 Midfielder + \alpha_3 Forward + \alpha_4 AGE + \alpha_5 AGE^2 \\ & + \alpha_6 GP\ BL + \alpha_7\ GP\ BL^2 + \alpha_8 GP\ INT + \alpha_9 GP\ INT^2 + \alpha_{10} GS \\ & + \alpha_{11} Birthday + \alpha_{12} SD + \alpha_{13} TD + \varepsilon \end{aligned}$$

I run two models, the first includes overall career player information (Model 1), while the second differentiates between recent and previous performance indicators (Model 2). Due to the panel characteristics of the data it is possible to exploit this additional information and account for some unobserved player specific characteristics via the random effects estimation technique. Hence, a Breusch/Pagan (1980) Lagrange-multiplier test is performed, which analyzes whether the pooled OLS model would work as well as the random effects model. The Prob > chi^2 statistic of the two regression models ($\chi^2 = 344.06, p < .01$ (Model 1)) and ($\chi^2 = 163.29, p < .01$ (Model 2)) clearly indicate that unobserved player heterogeneity is present. This suggests that applying the random effects model is more appropriate than the pooled OLS. Estimations of both models are illustrated in Table 6-3.

	Model 1		Model 2	
	Coefficients		Coefficients	
Variable	**OLS**	**RE**	**OLS**	**RE**
Defender	.020 (0.55)+	.020 (0.51)+	-.061 (-1.88)*	.100 (2.08)***
Midfielder	.127 (3.49)***	.127 (3.22)***	.021 (0.65)+	.151 (3.25)***
Forward	.276 (6.16)***	.276 (5.68)***	.092 (2.34)**	.235 (4.34)***
AGE	.612 (2.06)***	.612 (17.72)***	.451 (17.04)***	.491 (17.26)***
AGE^2	-.011 (-2.32)***	-.011 (-17.87)***	-.008 (-17.18)***	-.009 (-17.06)***
GP BL	.008 (2.12)***	.008 (16.42)***	/	/
GP BL^2	-.000 (-15.79)***	-.000 (-11.32)***	/	/
GP INT	.026 (1.84)***	.026 (11.01)***	/	/
GP INT^2	-.000 (-5.89)***	-.000 (-6.17)***	/	/
GS	.001 (1.07)+	.001 (1.06)+	/	/
GP BL (t-1)	/	/	.058 (16.83)***	.049 (14.96)***
GP BL $(t-1)^2$	/	/	-.001 (-7.55)***	-.001 (-6.83)***
GP BL (prior t-1)	/	/	.002 (3.93)***	.002 (3.39)***
GP BL (prior $t-1)^2$	/	/	-.000 (-2.50)**	-.000 (-1.65)*
GP INT (t-1)	/	/	.111 (7.86)***	.086 (6.49)***
GP INT $(t-1)^2$	/	/	-.005 (-4.09)***	-.003 (-3.00)***
GP INT (prior t-1)	/	/	.012 (5.05)***	.005 (1.85)*
GP INT (prior $t-1)^2$	/	/	-.000 (-2.37)**	-.000 (-0.36)+
GS (t-1)	/	/	.040 (8.40)***	.043 (9.36)***
GS (prior t-1)	/	/	-.002 (-1.62)+	-.002 (-1.97)**
Birthday	**.000 (2.30)****	**.000 (2.35)****	**.000 (0.78)+**	**.000 (0.92)+**
Season dummies	Included			
Team dummies	Included			
Adj R^2	0.506	0.514	0.644	0.640
Observations	3550		3550	

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance (t/z-values in brackets).

Table 6-3: Determinants of Player Salary

Looking at the results of both models, one can see that the impact of most variables on players' salary is the same for all four regression analyses. Supporting the findings of Frick (2007a) and Garcia-del-Barrio and Pujol (2005, 2006), goalkeepers earn rather low salaries. This might be explained by their high degree of specialization. Going in line with human capital theory, all variables indicating the experience of a player have a significantly positive impact on the players' salary with decreasing marginal returns. Additionally, the non-impact of career goals scored in the Bundesliga in Model 1 changes to a highly significant impact of goals scored in the previous season. To test if German players who make it to the Bundesliga despite being born shortly before the cut-off date earn a wage premium, the results differ between the models. Supporting the findings by Ashworth and Heyndels (2007), Model 1 suggests that players who make it into the league despite their unfavorable birth date are indeed additionally rewarded monetarily. But once I distinguish between recent and career performance parameters, this wage premium vanishes. Comparing which fraction of salary variance can be explained by the independent variables, I clearly prefer Model 2 over Model 1 as the adjusted R-square increases considerably. In addition, it seems to be very reasonable to distinguish between recent and previous performance expecting decreasing impact as the time lag increases. Furthermore, as the birth date of a player should not impact his performance on the field, there should be no impact on his salary, once I control for his performance. Therefore, efficient markets should not give a monetary reward or punishment for the players' birth date.

6.5 Hazard Rates

After observing a selection bias for the market for professional soccer players in section three, the question arises if there is a selection bias once a player has achieved to obtain a spot on the roster of a Bundesliga team. This section will shed light, applying a hazard rate model. For this purpose, I observe if players remain in the Bundesliga after a season to estimate the survival rates depending on the players' quarter of birth. Following Frick, Pietzner and Prinz (2007), I refer to "spell duration" as the numbers of consecutive seasons spent in the Bundesliga by a certain player.[79] On average, German players exhibit spell durations of 4.04 seasons, while the mean duration is considerably lower at just 2 seasons. Figure 6-3 provides the hazard rates of German players in the Bundesliga with regard to their position on the field. Since this data set only includes players who left the Bundesliga before the start of the 2008/2009 season, it reduces the number of

[79] Frick, Pietzner and Prinz (2007) show that estimating a similar hazard model leads to nearly identical results, regardless of including or excluding left-censored spells.

observed exits to 931. For players who were already in the league before the 1995/1996 season, information about their previous career length had been added and thus I control for left truncated cases. This leads to players exhibiting career length of more than 13 seasons.

It can be observed that forwards have on average shorter careers in the Bundesliga than players on the other positions. Frick, Pietzner and Prinz (2007), who come to a similar finding, explain this result by stating that the performance by forwards is easy to measure as it is often equated with the number of goals scored during the season. Hence, their average career length would be shorter than for players playing on the other positions. For the other positions on the field there is not such a clear indicator for performance.

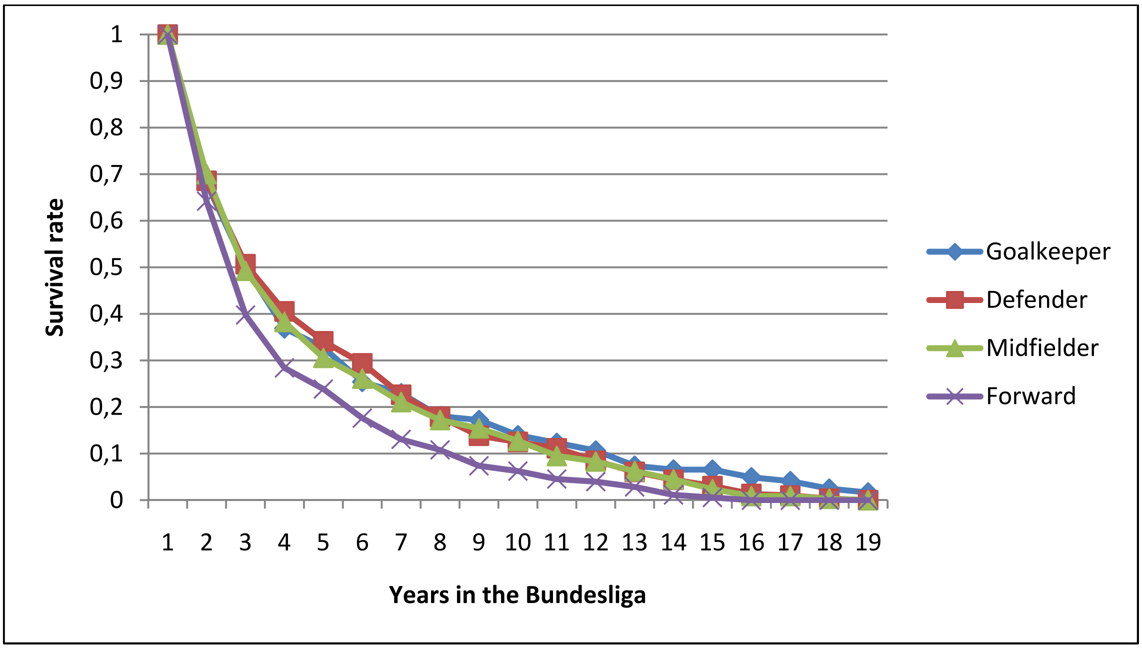

Figure 6-3: Survival Rates in the Bundesliga with Regard to the Position on the Field

For the following analysis I keep up the distinction from the third section as I assort players in four different groups according to their date of birth. As stated earlier, I expect players' performance on the field to be independent of their birth date. This indeed would lead to an expected stay in the league which is not dependent on the date of birth. Calculating the survival rates of individuals born in the first quarter after the cut-off date, one can observe that around 28 percent of the players leave the Bundesliga after just one season. This value is the lowest compared to the other quarters of birth, even though just by a small margin. The same holds true for the percentage of players who leave the league after just two years. But as one analyzes the survival rates for more than two seasons the percentage of players who manage to stay in the league for a certain period of time appears to be independent of the date of birth.

To check for potential statistical significant difference in the survival rates, a Cox (1972) semi-parametric proportional hazard model for censored data is applied. The Cox-Model is the most general regression model developed to investigate survival data, because it does not impose any assumptions concerning the nature of the shape of the underlying distribution. It assumes that the underlying hazard rate is a function of the independent variables and it solves the problem of censored observations. One additional feature of the model is that exogenous variables can be time-constant variables, but also, time-varying variables such as performance or age. As I expect the survival rates to be independent of the date of birth, I test whether the survival rates for players are dependent on the quarter of birth. This turns out not to be the case, as the quarter of birth does not have a significant effect on the spell duration in the Bundesliga while controlling for the performance indicators included in the salary regression.80 Results of the Cox semi-parametric proportional hazard model are presented in Table 6-4.81

[80] These results do not change as one omits the team- and season dummies.
[81] Results of a log logistic modell suggests that results are in line with the results presented in Table 6-5.

	Model 1		Model 2	
Variable	**Hazard Ratio**	**z-Value**	**Hazard Ratio**	**z-Value**
Defender	2.83	(8.24)***	3.27	(9.01)***
Midfielder	2.53	(7.23)***	2.98	(8.22)***
Forward	2.82	(7.07)***	3.50	(8.21)***
AGE	0.55	(-7.28)***	0.62	(-5.69)***
AGE^2	1.01	(7.84)***	1.01	(6.39)***
GP BL	0.98	(-16.37)***	/	/
GP BL^2	1.00	(8.90)***	/	/
GP INT	1.00	(-0.35)+	/	/
GP INT^2	1.00	(0.63)+	/	/
GS	1.00	(-0.89)+	/	/
GP BL (t-1)	/	/	0.94	(-5.30)***
GP BL $(t-1)^2$	/	/	1.00	(2.40)***
GP BL (prior t-1)	/	/	0.98	(-14.45)***
GP BL (prior $t-1)^2$	/	/	1.00	(7.18)***
GP INT (t-1)	/	/	0.91	(-1.20)+
GP INT $(t-1)^2$	/	/	1.01	(-1.67)*
GP INT (prior t-1)	/	/	1.00	(-0.04)+
GP INT (prior $t-1)^2$	/	/	1.00	(1.00)+
GS (t-1)	/	/	0.97	(-1.89)*
GS (prior t-1)	/	/	1.00	(1.97)**
Birthday	**1.01**	**(0.26)+**	**1.01**	**(0.44)+**
Observations	2850		2850	
No. Of Failure	931		931	
Wald Chi2	1178.53		1227.47	

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level

Table 6-4: Determinants of Spell Duration in the Bundesliga

For visual support of these results, Figure 6-4 shows the survival rates for players in the Bundesliga dependent on their quarter of birth. At this stage I do not control for the aforementioned performance indicators as I analyze the survival rates contingent on the quarter of birth. As it can be observed that the lines in Figure 6-4, which represent the hazard rates contingent on the quarters of birth, cross multiple times, the survival rates can be seen as independent of the date of birth.

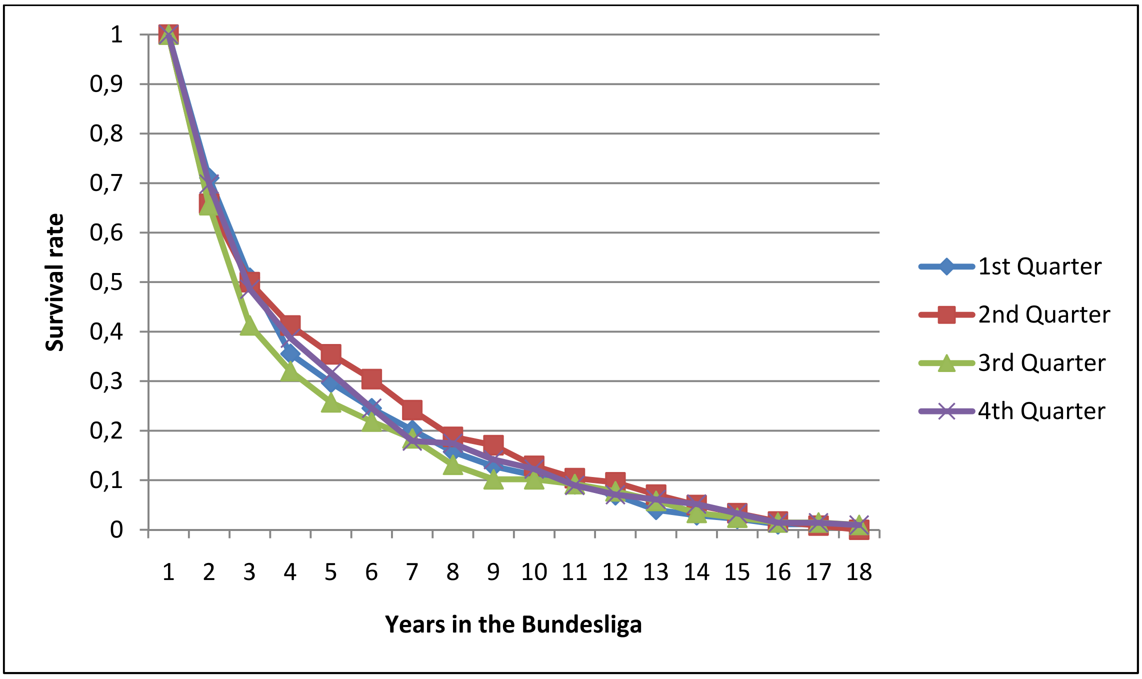

Figure 6-4: Survival Rates in the Bundesliga with Regard to the Quarter of Birth

6.6 Conclusions

The present chapter is subdivided into three parts concerning the relative age effect in the German Bundesliga. The first part offers an analysis concerning the unequal distribution of players in the league subject to their birth date. The data supports the popular thesis that players who are born shortly after the cut-off date are more often considered to be talented and hence get more support during their early playing years. This again improves their probability to become professional soccer players in later years and goes in line with the results of the majority of previous studies. The second part of the chapter deals with the salary determination of the players, taking the birth date of the players into consideration. Here I state that since the birth date of the players should not affect the performance it should not impact their salary. Separating between recent and career performance my data supports this hypothesis, contradicting the thesis stated by Ashworth and Heyndels (2007), who claim that players who belong to the youngest in their cohort and still make it to the professional level receive an additional monetary reward. The third and final part of this chapter deals with hazard rates of players in the Bundesliga. Going along with the proposition of the second part of the present chapter, the birth date should not impact the players' performance once he achieves to obtain a roster spot in the Bundesliga and hence should not have an impact on his chance of survival in the league. Data also supports this thesis, as the length of stay in the Bundesliga proves to be independent of the date of birth.

In summary, the selection into the Bundesliga is affected by the date of birth, while the implementation of cut-off dates does not impact the players' salary or the length of stay in the league. Still the question arises how the discriminating effect of cut-off dates can be resolved. The literature offers a number of possible solutions like the yearly change of the cut-off date[82] or allowing the age difference in a cohort to be maximally six month.[83] These ideas would probably reduce the problem, still the organizational excess work does not justify the change of the existing rules.

Further work using the present data set might include observing the career track of the included athletes. Since data concerning the switching between youth teams is available, it might be of interest at what age young soccer players change from the youth team of their small home town to the youth team of a "big club" to be provided with better practice. In this context the date of birth might be a factor, as I would expect players who are born closely after to the cut-off date to be identified as talents at an earlier stage than late-born players. This proposition is based on the fact that the relative age difference decreases as the age of the players increases. Furthermore, the date of the first-time nomination to a German national youth team might also be influenced by the players' birth date, especially since these teams are selected from a considerably larger cohort.

[82] See Ashworth and Heyndels (2007).
[83] See Billari and Pellizzari (2008).

7 Sabotage in Heterogeneous Tournaments: A Field Study

7.1 Introduction

In practice, tournaments or contests are ubiquitous. A typical example is an internal labor market tournament, in which employees compete for a bonus or a promotion (Lazear and Rosen 1981). Other examples include R&D races, litigation contests, rent-seeking contests, political campaigns or sports contests.[84]

In tournaments, only the relative performance of the contestants matters. The participants therefore have an incentive to decrease the performance of their opponents. This is typically called the "sabotage problem". In the meantime, a number of theoretical contributions on sabotage in tournaments have appeared (e.g. Lazear 1989, Konrad 2000, Chen 2003, 2005, Kräkel 2005, Münster 2007, Gürtler 2008 or Gürtler & Münster 2008). Unfortunately, however, there are only a few empirical studies. Garicano and Palacios-Huerta (2005) for instance show that an increase in the price difference in professional soccer (from two to three points for a win) has led to more sabotage (as measured by the number of defenders and the number of disciplinary actions). Drago and Garvey (1998) find that in Australian companies employees help each other less if they are paid according to their relative performance.[85] Harbring et al. (2007) find in a laboratory experiment that subjects tend to retaliate against sabotage activities if the identity of the saboteur is known. Moreover, they are able to show that sabotage is more pronounced if the identity of the saboteur is unknown since retaliation is then less strong.[86]

The aim of this chapter is to extend both, the theoretical and the empirical literature on sabotage in tournaments. We consider a tournament between two heterogeneous players, both of whom may take legal and illegal actions to increase their probability of winning. We impose two assumptions: First, the favorite is more productive than the underdog with respect to legal actions. Second, the players' cost function is such that

[84] See Frick (2003) or Konrad (2007) for surveys.
[85] Note that help can be interpreted as the opposite of sabotage.
[86] See Harbring and Irlenbusch (2004, 2005) for further experiments on sabotage in tournaments.

both activities are substitutes. We then show that the favorite chooses a higher level of legal and a lower level of illegal actions than the underdog. In other words, the favorite is sabotaged more strongly than the underdog. This complements the theoretical literature on sabotage in asymmetric tournaments, where the favorite is sabotaged the most because he is the truly dangerous rival (Chen 2003, Münster 2007). This latter finding, however, requires at least three contestants. In our model, we show that the favorite is subject to most illegal activities even if there are only two players, a result that has not been derived before.

In a second step, we perform an empirical analysis to test our derived results. Similar to Garicano and Palacios-Huerta (2005) we use data from professional soccer. As a proxy for legal activities we use the percentage of fair, i.e. successful, tackles of a team, while sabotage is measured by the percentage of fouls a team has committed. We further use betting odds to determine the favorite and the underdog in a particular match. Controlling for a number of additional factors that may have an impact on legal and illegal activities we confirm both our theoretical results. In particular, we find that a team fouls less often and wins more tackles in a fair way the more it is favored by the betting odds.

Altogether, we find that sabotage is a serious problem in heterogeneous tournaments. We show that players indeed take actions to reduce the performance of their opponents. Apart from this direct negative effect, this shifts their focus away from own legal actions. Finally, if tournaments are also used for selection purposes, sabotage increases the probability of selecting (and promoting) the wrong player. As the favorite is subject to most illegal actions, sabotage increases the likelihood for the underdog to win the tournament. For an employer designing an intra-company promotion tournament it is thus important to prevent the employees from engaging in sabotage activities. One way to achieve this is to punish detected sabotage harshly. Another way is to make it more difficult for the employees to sabotage each other. The employer may for instance not reveal the identities of the contestants. Moreover, he may organize a tournament between employees who are separated from each other (i.e. they are working in different business units or departments in different cities).

The chapter is organized as follows: The next section presents our model and the theoretical findings. In section 3, we describe our data. Section four contains the empirical results, and section five concludes.

7.2 The Model

7.2.1 Description of the Model and Notation

Consider a situation, in which two risk-neutral players, i=1, 2, compete in a tournament. The player with the higher performance is declared the winner and receives the winner's prize $w > 0$, while the loser's prize is normalized to zero. We focus on actions that are intended to decrease the opposing player's performance. This can either be done „fairly", i.e. by actions that are in accordance with the rules of the game, or „unfairly", i.e. by violating the rules of the game.[87] We denote by $e_i \geq 0$ a player's fair effort and by $s_i \geq 0$ his unfair or sabotage effort. The players' performances are then given by

$$(1) \qquad y_1 = \bar{y}_1 - e_2 - bs_2 + \varepsilon_1 \text{ and } y_2 = \bar{y}_2 - ae_1 - bs_1 + \varepsilon_2,$$

with $\bar{y}_i$ as the players' gross performance from their (unmodeled) productive decisions, a, b as productivity parameters and ε_i as a random term being independently distributed according to pdf $f_i(\cdot)$. Let the pdf of $\varepsilon := \varepsilon_2 - \varepsilon_1$ be defined as $g(\cdot)$ and denote the corresponding cdf as $G(\cdot)$.

We assume the players to be heterogeneous. In particular, we have $a > 1$, $a > b$ and $\Delta\bar{y} := \bar{y}_1 - \bar{y}_2 \geq 0$. This means that player 1 is better in reducing his opponent's output in a fair way and also has a weakly higher productive performance.[88] In the following, we therefore speak of player 1 as the favorite and player 2 as the underdog.

[87] We introduce two efforts decreasing the opponent's performance to keep the model in line with the empirical part of the chapter, where the available proxy variables also decrease the opposing team's performance. Note, however, that the model results would continue to hold, if e would describe a productive effort increasing the own performance. This is demonstrated in Appendix A.

[88] As we will show, the latter assumption does not affect the qualitative results of our model.

Both types of effort are costly to a player and these costs are given by the function $C_i = C(e_i, s_i)$. The function $C(e_i, s_i)$ is assumed to be symmetric[89] and to satisfy[90] $\frac{\partial C(e_i, s_i)}{\partial e_i} \geq 0$, $\frac{\partial^2 C(e_i, s_i)}{\partial e_i^2} > 0$ and $\frac{\partial^2 C(e_i, s_i)}{\partial e_i \partial s_i} > 0$, for $e_i, s_i > 0$. The last assumption implies that the players' actions are substitutes. Thus, if a player decides to increase his fair effort, he decreases his unfair effort and vice versa. For the application we address, this assumption seems very suitable. When trying to stop the opponent, a player can either exert effort to do this fairly or he can just foul the opponent, in which case he has to accept the consequences (e.g. a free kick, a yellow or a red card). The more fouls a player commits in a game, the less fairly he behaves. Thus, it is reasonable to assume costs to be such that both kinds of effort are substitutes.

Finally[91], we impose the Inada-conditions $\frac{\partial C(0, s_i)}{\partial e_i} = 0$ and $\frac{\partial C(e_i, s_i)}{\partial e_i} = \infty$, for $e_i \to \infty$.

These conditions imply that we have an interior solution, where optimal efforts are strictly positive, but finite.

[89] One may argue that the marginal costs of fair and unfair actions are different. Different marginal costs, however, have a similar effect as different marginal productivities of the actions in the performance functions. It is, therefore, sufficient to assume that *b* is different from 1.

[90] Note that the symmetry of the cost function implies that we obtain the same conditions if we consider the partial derivatives with respect to the sabotage activity.

[91] Again, the symmetry of the cost function implies that we obtain the same conditions for the sabotage activity.

7.2.2 Solution to the Model

In the tournament, each player chooses e_i and s_i so as to maximize his expected payoff. This payoff is given by

$$
\begin{aligned}
EU_1 &= Prob\{\bar{y}_1 - e_2 - bs_2 + \varepsilon_1 > \bar{y}_2 - ae_1 - bs_1 + \varepsilon_2\}w - C(e_1, s_1) \\
&= Prob\{\varepsilon_2 - \varepsilon_1 < \bar{y}_1 - \bar{y}_2 + ae_1 - e_2 + b(s_1 - s_2)\}w - C(e_1, s_1) \\
&= G(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2))w - C(e_1, s_1)
\end{aligned} \tag{2}
$$

for player 1 and

$$
EU_2 = [1 - G(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2))]w - C(e_2, s_2) \tag{3}
$$

for player 2.

The optimality conditions are given by[92]

$$
\frac{\partial EU_1}{\partial e_1} = ag(\Delta\bar{y} + ae_1^* - e_2^* + b(s_1^* - s_2^*))w - \frac{\partial C(e_1^*, s_1^*)}{\partial e_1} = 0 \tag{4}
$$

$$
\frac{\partial EU_1}{\partial s_1} = bg(\Delta\bar{y} + ae_1^* - e_2^* + b(s_1^* - s_2^*))w - \frac{\partial C(e_1^*, s_1^*)}{\partial s_1} = 0 \tag{5}
$$

---

[92] A sufficient condition for this first-order approach to be valid is that the players' objective functions are strictly concave. This requires $\frac{\partial^2 EU_i}{\partial e_i^2} < 0$ and $\frac{\partial^2 EU_i}{\partial e_i^2}\frac{\partial^2 EU_i}{\partial s_i^2} - (\frac{\partial^2 EU_i}{\partial e_i \partial s_i})^2 > 0$ (see Sydsaeter, Hammond, Seierstad and Strom 2005: 55). For player 1, for instance, these conditions can be written as

$$
a^2 g'(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2))w - \frac{\partial^2 C(e_1, s_1)}{\partial e_1^2} < 0
$$

and

$$
\begin{aligned}
&[a^2 g'(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2))w - \frac{\partial^2 C(e_1, s_1)}{\partial e_1^2}][b^2 g'(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2))w - \frac{\partial^2 C(e_1, s_1)}{\partial s_1^2}] \\
&-[abg'(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2))w - \frac{\partial^2 C(e_1, s_1)}{\partial e_1 \partial s_1}]^2 > 0.
\end{aligned}
$$

This is e.g. fulfilled, if $\frac{\partial^2 C(e_1, s_1)}{\partial e_1^2}$ is everywhere high enough. In Section 2.3, we consider a specific example where these conditions are always fulfilled.

(6) $$\frac{\partial EU_2}{\partial e_2} = g(\Delta\bar{y} + ae_1^* - e_2^* + b(s_1^* - s_2^*))w - \frac{\partial C(e_2^*, s_2^*)}{\partial e_2} = 0$$

(7) $$\frac{\partial EU_2}{\partial s_2} = bg(\Delta\bar{y} + ae_1^* - e_2^* + b(s_1^* - s_2^*))w - \frac{\partial C(e_2^*, s_2^*)}{\partial s_2} = 0$$

Using the optimality conditions (4) to (7), we can derive the following proposition:

Proposition 1: In equilibrium, the favorite exerts higher fair effort than the underdog but sabotages less (i.e. $e_1^* > e_2^*$ *and* $s_1^* < s_2^*$*). Moreover, if* $b \geq 1$ *(*$b < 1$*), we have* $e_2^* \leq s_2^*$ *(*$e_2^* > s_2^*$*).*

Proof: See Appendix B.

According to Proposition 1 the favorite always chooses a higher fair effort than the underdog, but sabotages less. Two effects drive this result. First, the favorite has a higher return on fair effort which, in turn, induces him to engage more strongly in the legal activity. Second, both types of effort are substitutes. This means that a player engaging more strongly in one activity engages less strongly in the other one. Accordingly, player 1, choosing a higher fair effort, sabotages less.

In Sections three and four, we are going to test these results using data from German professional soccer. Before we do so, however, we consider a parameterized version of the tournament model to develop a better understanding of the sabotage problem.

7.2.3 Parameterized Version of the Model

In this section, we assume specific forms for our functions to be able to derive some closed-form solutions for the optimal efforts. To keep the model tractable, we assume the composed random variable $\varepsilon_2 - \varepsilon_1$ to be uniformly distributed on $[-u,u]$, with u>0[93], and effort costs to be given by $C(e_i,s_i) = c(0.5e_i^2 + 0.5s_i^2 + ke_is_i)$, with $c>0$ and $k \in (0, \min\left\{\frac{b}{a},\frac{1}{b}\right\})$[94]. Then, the optimality conditions simplify to[95]

(4') $$\frac{aw}{2u} - ce_1^* - cks_1^* = 0$$

(5') $$\frac{bw}{2u} - cs_1^* - cke_1^* = 0$$

(6') $$\frac{w}{2u} - ce_2^* - cks_2^* = 0$$

(7') $$\frac{bw}{2u} - cs_2^* - cke_2^* = 0$$

Solving these conditions simultaneously, optimal efforts can be written as[96]

(8) $$e_1^* = \frac{w(a-bk)}{2cu(1-k^2)}, s_1^* = \frac{w(b-ak)}{2cu(1-k^2)}, e_2^* = \frac{w(1-bk)}{2cu(1-k^2)}, s_2^* = \frac{w(b-k)}{2cu(1-k^2)}$$

From these conditions, it is straightforward to see that all efforts are increasing in the prize w and decreasing in u (which measures how strongly the tournament outcome is influenced by factors beyond the players' control) and the cost parameter c. Moreover, e_1^* (s_1^*) is increasing in a (b) and decreasing in b (a). This is intuitive. If player 1

[93] If ε_1 is a constant v and ε_2 is uniformly distributed on $[-u+v,u+v]$, the composed random variable ε_2-ε_1 would be uniformly distributed on $[-u,u]$.

[94] See for this kind of cost function e.g. Itoh (1994). Note that the function does not fulfill the Inada-conditions described above. We will nevertheless see that the solution is an interior one.

[95] The sufficient conditions for optimality are $-c<0$ and $c^2-(ck)^2>0$. Under the assumptions imposed on the parameters c and k, these conditions are always fulfilled.

[96] Note that the assumption $k < \min\left\{\frac{b}{a},\frac{1}{b}\right\}$ ensures that all equilibrium efforts are strictly positive.

becomes more productive with respect to his fair (unfair) activity, he increases his fair (unfair) effort and, since both efforts are substitutes, decreases his unfair (fair) effort. A similar argument applies to the second player. Finally, it is not clear how optimal efforts react to changes in *k*. On the one hand, an increase in *k* leads to higher effort costs, thus reducing efforts. On the other hand, it may yield a substitution of one kind of effort by the other. Therefore, efforts may either increase or decrease.

From the optimal efforts, we are able to compute the players' winning probabilities. We can show that player 1 wins with probability

$$(9) \qquad G(\Delta\bar{y} + ae_1^* - e_2^* + b(s_1^* - s_2^*)) = G(\Delta\bar{y} + \frac{w(a-1)}{2cu(1-k^2)}(1 + a - 2bk))$$

It is straightforward to see that player 1 is more likely to win, if $\Delta\bar{y}$ or *a* gets higher and *c* or *u* gets lower. All this is intuitive. Moreover, we can see that player 1's winning probability is also increasing in *w*: while both players increase their efforts as a reaction to a higher price, the first player's increase is more effective in influencing the winning probability. As *k* does not have a clear-cut effect on the efforts, its effect on the winning-probability is ambiguous, too. Finally, player 1 becomes less likely to win the tournament if *b* gets higher. This has the following implication: If the tournament organizer were able to completely rule out unfair behavior (which is the same as setting *b* equal to zero), the more able player were most likely to win. Hence, if tournaments are also used for selection purposes, sabotage increases the probability of selecting the wrong player. As the favorite is subject to more illegal actions, sabotage increases the likelihood for the underdog to win the tournament.

7.3 Data Set and Descriptive Statistics

In the following section we empirically test our proposition that in a contest with two heterogeneous players the favorite prefers legal ("fair") actions while the underdog prefers illegal ("unfair") activities to increase his probability of winning. Our empirical investigation is based on a data set from the German "Bundesliga" covering a 2.5 year period from the start of the 2005/06 season until the middle of the 2007/08 season. For that period we have compiled complete and detailed information on all the 765 matches (2005/06: 306 matches; 2006/07: 306 matches; 2007/08: 153 matches). The data come from the league's homepage (www.bundesliga.de), the highly respected soccer magazine "Kicker" (www.kicker.de) and from the largest betting company in the country (www.oddset.de).

Most important in our context is the question of how to operationalize the dependent and independent variables. Since the act of taking the ball away from an opposing player by either kicking it away or by stopping that player with one's own feet is either considered a successful tackle or a foul, we distinguish between these two outcomes as being the results of either "fair" or "unfair" efforts. Hence we define as "constructive" or "fair" effort the home team's number of successful tackles divided by the total number of tackles during a match $\frac{n\ of\ successful\ \ tackles\ of\ home\, team}{total\ number\, of\ successful\ \ tackles}$. Our preferred measure of "destructive" or "unfair" effort is the number of fouls committed by the home team divided by the total number of fouls during a particular match $\frac{n\ of\ fouls\ \ of\ home\, team}{total\ number\, of\ \ fouls}$.[97]

Following Fama (1970), we assume the betting market to be efficient in the sense that prices (the odds) fully reflect all available information. He distinguishes between three different forms of test depending on the information used: "Weak form" tests use past prices only, "semi-strong" tests use all publicly available information and "strong" tests also include information that is only accessible to certain people (see Kuypers 2000). In betting markets semi-strong efficiency implies that the incorporation of publicly available information on the two teams' playing strength, their current form, player injuries, etc. should not improve the accuracy of outcome predictions based on odds. In the empirical part of this chapter we therefore use betting odds to distinguish between the favorite and the underdog to analyze the effect of heterogeneity (i.e. match uncertainty) on the choice of fair and unfair effort. Our betting odds are from "Oddset", which pub-

[97] Note that the number of tackles and the number of fouls committed by the away team is accounted for in the respective denominator.

lishes these figures a few days before the weekend (usually on Tuesday). Thus, all bets are fixed in the sense that information regarding the fitness of key players, injuries, playing strategy, etc. that becomes available between Tuesday and Saturday (when most of the matches are played) will have no impact on the odds.

For example, in week 16 of the 2007/08 season, Bayern Munich played MSV Duisburg at home and was heavily favored by the bookmakers. In case of a home win bettors received an amount of 1.10 € for every € they had placed on the home team. In the case of a draw the payoff to bettors was 5.50 € and in the unlikely case of an away win the payoff would have been 10.00 €. Summing up the inverse of the quotes not only yields the mark-up of the betting company, but also allows computation of the implicit probabilities of a home win, a draw and an away win.[98]

The payout ratio is determined as follows:

$$Payout\ ratio = \frac{1}{\frac{1}{Payoff\ home\,win} + \frac{1}{Payoff\ draw} + \frac{1}{Payoff\ away\,win}},$$

which in the case of the above mentioned game resulted in a payout ratio of 0.8397.[99] To calculate the implicit probabilities of the possible outcomes, we divide the payout ratio by the payoffs associated with the respective outcomes. This leads to an implicit probability of a home win of 76.3 percent, while the implicit draw and away win probabilities are 15.3 percent and 8.4 percent respectively. To measure the heterogeneity between the opponents, we now introduce "HET" which will later serve as our main exogenous variable. HET is calculated as the difference between the implicit winning probabilities of the opposing teams:

$$HET = P_H - P_A,$$

[98] Sauer (1998) provides a detailed analysis of the economics of wagering markets. Forrest, Goddard and Simmons (2005) demonstrate the (increasing) effectiveness of the betting market using data from English football.

[99] This implies that the bookmaker's mark-up is about 16 percent - a value that is quite high compared to most online bookmakers. Using data from www.gamebookers.com Stadtmann (2006) calculates an average mark-up of only 12 percent.

where P_H and P_A represent the implicit winning probabilities of home and away team. Hence HET can theoretically vary between -1 and +1. Positive values indicate that the home team is the favorite while in the case of negative values the away team is the favorite. The further away HET is from zero, the more heterogeneous the two teams facing each other are. The overall (expected) home advantage is obvious from our Figure 7-1, as the mean of HET is 0.152.

As stated in our proposition in the previous section, we expect the favorite to exert a higher level of fair effort and a lower level of sabotage compared to the underdog, as we measure fair effort as the percentage of successful tackles and sabotage as the percentage of fouls. Obviously, we do not only have to control for the degree of heterogeneity of the opposing teams but also for some other factors that may have an influence on the effort levels chosen by the two clubs. These controls are necessary in order to eliminate alternative explanations for either team's choice of fair and unfair effort. Thus, we include the natural logarithm of the number of spectators (ATT) to control for the atmosphere in the arena as well as a dummy-variable DERBY, which takes a value of 1 if the respective match is one between two long-time rivals whose home grounds are located closely to each other.

Variable	Description	Mean	Min.	Max.
FOULS	Percentage of Fouls by Home Team (UNFAIR)	0.478	0.208	0.792
TACKLES	Percentage of Tackles Won by Home Team (FAIR)	0.514	0.311	0.683
ATT	Attendance	40105	10914	81264
DERBY	Match is a Derby	0.024	0	1
HWP	Winning Probability of Home Team	0.437	0.149	0.763
AWP	Winning Probability of Away Team	0.285	0.084	0.609
HET	HWP – AWP	0.15	-0.46	0.68
ODDS	Log odds of HWP – AWP	0.06	-0.79	0.77

Table 7-1: Descriptive Statistics

Table 7-1 presents the descriptive statistics of the variables used in the estimations (Kernel density estimates of the two dependent variables (HET and log odds of HET) are displayed in Appendix C)).

7.4 Empirical Results

The main purpose of the empirical section of this chapter is to investigate whether weaker teams have an incentive to choose more unfair and unconstructive effort, while stronger clubs have a preference for fair and constructive effort. We employ two different estimation techniques which produce more or less identical results, documenting the robustness of our findings.

We start with two conventional OLS-estimations where the percentage of fouls by the home team (FOULS) and the percentage of successful and fair tackles won by the home team (TACKLES) respectively are the dependent variables. These specifications have the advantage that we can control for systematic effects on the residual errors; i.e. the estimation errors are robust (White 1980) and clustered at the match level. While this procedure seems to produce conclusive results, we have not yet paid attention to the fact that the two endogenous variables (FOULS/TACKLES) are proportions or percentage variables with values must ranging by definition from zero to one. In order to obtain unbiased estimates a traditional solution to this problem is to perform a logit transformation of the variables (($y \rightarrow \log(y/(1-y))$)). Following such a transformation it is then possible to use the OLS method.

Variable	Model 1		Model 2	
	(OLS)		LOGIT-TRANS (OLS)	
	TACKLES	FOULS	TACKLES	FOULS
log(ATT)	0.004 (0.96)+	-0.002 (-0.27)+	0.017 (0.95)+	-0.010 (-0.32)+
DERBY	-0.001 (-0.09)+	0.003 (0.16)+	-0.004 (-0.10)+	0.012 (0.18)+
HET	**0.027 (3.00)*** **	**-0.070 (-4.65)*** **	**0.111 (3.02)*** **	**-0.290 (-4.65)*** **
REFEREE-DUMMIES	Included		Included	
CONST	0.491 (10.25)***	0.459 (5.97)***	-0.321 (-0.17)+	-0.150 (-0.47)+
Adj. R^2	0.04	0.05	0.04	0.05
F-Test	1.30+	1.97*	1.37+	1.98**
N of Cases	765	765	765	765

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level

Table 7-2: Determinants of Fair and Unfair Behavior

Note: Both models are estimated with White robust standard errors. 21 referee dummies are included in the estimations (Manuel Graefe is the reference referee. The full results are available upon request).

Table 7-2 displays the contribution of the independent variables in explaining the variance of the two left-hand side variables. It appears that only a small fraction of that variation can be explained by our set of exogenous parameters. The number of spectators and the character of a match as a “neighborhood duel” do not have any statistically significant impact on the “intensity” of the match. Since a number of recent studies have documented a tendency of referees to favor the home team (Sutter and Kocher 2004, Garicano, Palacios-Huerta and Prendergast 2005, Petterson-Lidbom and Priks 2009, Buraimo et al. 2007, Scoppa 2008, Dohmen 2005)[100], we initially expected to find that the higher the attendance in a stadium, the more biased the referee’s decision-making towards the home team will be.[101] Moreover, we expected that type of bias to be particularly strong in local derbies with their peculiar “atmosphere”. It turns out, however, that the coefficient of these two match-variables have the “correct” sign in all of our

[100] Moreover, a number of recent studies have demonstrated that referees react to financial incentives in the same way as “ordinary” people by adjusting their effort levels (see Frick et al. 2009, Rickman and Witt 2008).

[101] Replacing the number of spectators by the capacity utilization leaves the findings virtually unaffected. The results are, of course, available from the authors upon request.

estimations, but their magnitude is not statistically significant or economically relevant.[102]

Most important in our context is the coefficient of our key independent variable, the heterogeneity measure HET. Since HET measures the difference in the playing strength of the two opposing teams, the highly significant coefficients in the TACKLES- as well as in the FOULS-model support our theoretically derived proposition that favorites usually exert higher levels of "legal" effort while the respective underdogs' best answer is to engage in "illegal" activities.[103]

7.5 Conclusion

The present chapter consists of two different, yet closely related parts. In the first (theoretical) section we develop a formal model demonstrating that the favorite in a tournament chooses legal activities, while the underdog is tempted to engage in illegal activities. The reasons for this are twofold: First, the favorite is more productive with respect to legal activities and, second, the two types of activities are substitutes. In a second (empirical) section we demonstrate the plausibility of the theoretical model by using match-level data from German professional soccer. In particular, we find that teams that are more likely to win a match (as measured by the respective betting odds) win signifi-

[102] Since both left-hand side variables (FOULS and TACKLES) are determined by the same set of explanatory variables, it may be advisable to estimate a seemingly unrelated regression model (Zellner 1962). The SURE approach takes into account the potential correlation of the residuals in the two models. If such a correlation exists, simple OLS-regressions are likely to produce inefficient estimates (Frick 2004). Although the findings of the SURE specification are identical to the ones from the OLS-models, the Lagrange-Multiplier Test (Breusch and Pagan 1980) of ($\chi^2 = 210.1$ $p<.001$) indicates that the correlation of the residuals in the FOULS and the TACKLES-equations is highly significant. Nevertheless, the relevant coefficients are not at all affected by that correlation. Moreover, we have also estimated a random-effects version of the SURE approach as developed by Biörn (2004). While most coefficients remained at their initial level, the statistical significance of our heterogeneity measure decreased in the TACKLES-model (which is due to some unobserved referee specific heterogeneity, such as differences in cognitive skills). The findings are available from the authors upon request.

[103] It may also be argued that the logit-transformation is not always feasible and the coefficients are difficult to interpret if the dependent variable takes on values of 0 and 1 (Wooldrigde 2001: 661). We therefore also employed the "fractional logit estimator" developed by Papke and Wooldridge (1996) to get rid of that particular problem. In that latter estimation the coefficient of our heterogeneity measure increases dramatically compared to the OLS-estimation (as well as the SURE-model). These results are also available from the authors upon request.

cantly more tackles in a fair way and, at the same time, commit significantly fewer fouls.

Intra-company tournaments are typically used to induce incentives and to select the most able contestants. Our findings indicate that either of these two objectives may be difficult to reach. On the one hand, we find that weaker contestants ("underdogs") tend to engage in sabotage which shifts their focus away from legal activities and thus reduces the incentive effects of tournaments. On the other hand, stronger contestant ("favorites") are sabotaged more heavily which, in turn, reduces the selection efficiency of tournaments. For an employer designing an intra-company promotion tournament it is therefore important to prevent the employees from engaging in sabotage activities. One way to achieve this is to punish detected sabotage harshly. Another way is to make it more difficult for the employees to sabotage each other. The employer may for instance not reveal the identities of the contestants. Moreover, he may organize a tournament between employees that are locally separated, for example in units in different cities.

From time to time the organizers of professional team sports leagues in general and of soccer leagues in particular (i.e. the respective national associations) instruct their referees to punish certain types of fouls more harshly.[104] In this sense, sabotage should become more costly and the teams should sabotage less. An interesting array for future research would therefore be to analyze whether these measures indeed affect behavior. This may offer some indication on the effectiveness of punishments in tackling the sabotage problem.

[104] For instance, referees are nowadays advised to punish tackling from behind with a red card, the strongest punishment a referee can inflict on a player.

7.6 Appendix A

In this appendix, we show that all the results of our model continue to hold, if e describes a productive effort increasing the own performance. To see this, consider the same model as before with the exception that the players' performances are now given by

(1') $\quad y_1 = \bar{y}_1 + ae_1 - bs_2 + \varepsilon_1$ and $y_2 = \bar{y}_2 + e_2 - bs_1 + \varepsilon_2$

Then, player 1's winning-probability can be written as

$$\begin{aligned} & Prob\{\bar{y}_1 + ae_1 - bs_2 + \varepsilon_1 > \bar{y}_2 + e_2 - bs_1 + \varepsilon_2\} \\ (10) \quad & = Prob\{\varepsilon_2 - \varepsilon_1 < \bar{y}_1 - \bar{y}_2 + ae_1 - e_2 + b(s_1 - s_2)\} \\ & = G(\Delta\bar{y} + ae_1 - e_2 + b(s_1 - s_2)) \end{aligned}$$

This is the same winning probability as in the original model. As nothing else was changed, all our results continue to hold. Q.E.D. ■

7.7 Appendix B

In this appendix, we present the proof of Proposition 1. We restrict attention to the case where $b < 1$. The proof in the case where $b \geq 1$ is completely analogous.

From (4) and (5), we have $\frac{1}{a}\frac{\partial C(e_1^*, s_1^*)}{\partial e_1} = \frac{1}{b}\frac{\partial C(e_1^*, s_1^*)}{\partial s_1}$. As $a > b$, we cannot have $e_1^* = s_1^*$. Similarly, a comparison of (6) and (7) shows that we cannot have $e_2^* = s_2^*$. Note further that we cannot have $e_1^* < s_1^*$ since then player 1 could deviate to $\tilde{e}_1 = s_1^*$ and $\tilde{s}_1 = e_1^*$. Such a deviation would leave the player's effort cost unchanged, while the player's winning probability would increase from $G(\Delta\bar{y} + ae_1^* - e_2^* + b(s_1^* - s_2^*))$ to

$G(\Delta\bar{y}+as_1^*-e_2^*+b(e_1^*-s_2^*))$. Thus, the deviation would be profitable. We therefore have $e_1^*>s_1^*$ and with a similar argument $e_2^*>s_2^*$.

Suppose now that $e_1^*=e_2^*$ and $s_1^*=s_2^*$. This, however, contradicts the condition $\frac{1}{a}\frac{\partial C(e_1^*,s_1^*)}{\partial e_1}=\frac{\partial C(e_2^*,s_2^*)}{\partial e_2}$, which we obtain from (4) and (6). The ordering $e_1^*\le e_2^*$ and $s_1^*\le s_2^*$ (with one inequality being strict) also contradicts this condition. Similarly, $e_1^*\ge e_2^*$ and $s_1^*\ge s_2^*$ (with one inequality being strict) contradicts $\frac{\partial C(e_1^*,s_1^*)}{\partial s_1}=\frac{\partial C(e_2^*,s_2^*)}{\partial s_2}$, which follows from a comparison of (5) and (7).

Consider now the case $e_2^*\ge e_1^*>s_1^*\ge s_2^*$. As each player's choice is (expected) utility-maximizing, a player prefers his own choice to the other player's choice. Hence, it must be that

(11) $G(\Delta\bar{y}+ae_1^*-e_2^*+b(s_1^*-s_2^*))w-C(e_1^*,s_1^*)\ge G(\Delta\bar{y}+ae_2^*-e_2^*)w-C(e_2^*,s_2^*)$ and

(12) $[1-G(\Delta\bar{y}+ae_1^*-e_2^*+b(s_1^*-s_2^*))]w-C(e_2^*,s_2^*)\ge[1-G(\Delta\bar{y}+ae_1^*-e_1^*)]w-C(e_1^*,s_1^*)$.

Transforming (11) and (12) yields

(13) $C(e_1^*,s_1^*)-C(e_2^*,s_2^*)\le w[G(\Delta\bar{y}+ae_1^*-e_2^*+b(s_1^*-s_2^*))-G(\Delta\bar{y}+ae_2^*-e_2^*)]$ and

(14) $C(e_1^*,s_1^*)-C(e_2^*,s_2^*)\ge w[G(\Delta\bar{y}+ae_1^*-e_2^*+b(s_1^*-s_2^*))-G(\Delta\bar{y}+ae_1^*-e_1^*)]$.

Combining these conditions, we obtain

$$
\begin{aligned}
& w[G(\Delta\bar{y}+ae_1^*-e_2^*+b(s_1^*-s_2^*))-G(\Delta\bar{y}+ae_2^*-e_2^*)]\ge \\
(15)\quad & w[G(\Delta\bar{y}+ae_1^*-e_2^*+b(s_1^*-s_2^*))-G(\Delta\bar{y}+ae_1^*-e_1^*)] \\
& \Leftrightarrow G(\Delta\bar{y}+ae_1^*-e_1^*)\ge G(\Delta\bar{y}+ae_2^*-e_2^*)
\end{aligned}
$$

Assuming $e_2^* \geq e_1^*$, this condition can only hold if $e_1^* = e_2^*$. Together with $\frac{\partial C(e_1^*, s_1^*)}{\partial s_1} = \frac{\partial C(e_2^*, s_2^*)}{\partial s_2}$, this implies $s_1^* = s_2^*$. As before this leads again to a contradiction.

Hence, the only case that remains has $e_1^* \geq e_2^* > s_2^* \geq s_1^*$. Here, we have to show that neither $e_1^* \geq e_2^*$ nor $s_2^* \geq s_1^*$ can be binding (recall that both conditions cannot be binding at the same time). First, let $e_1^* = e_2^*$, but $s_2^* > s_1^*$. Again, this contradicts the condition $\frac{1}{a}\frac{\partial C(e_1^*, s_1^*)}{\partial e_1} = \frac{\partial C(e_2^*, s_2^*)}{\partial e_2}$. Second, let $e_1^* > e_2^*$ and $s_2^* = s_1^*$. This contradicts the condition $\frac{\partial C(e_1^*, s_1^*)}{\partial s_1} = \frac{\partial C(e_2^*, s_2^*)}{\partial s_2}$. Thus, in equilibrium it must be the case that $e_1^* > e_2^* > s_2^* > s_1^*$. Q.E.D. ■

7.8 Appendix C

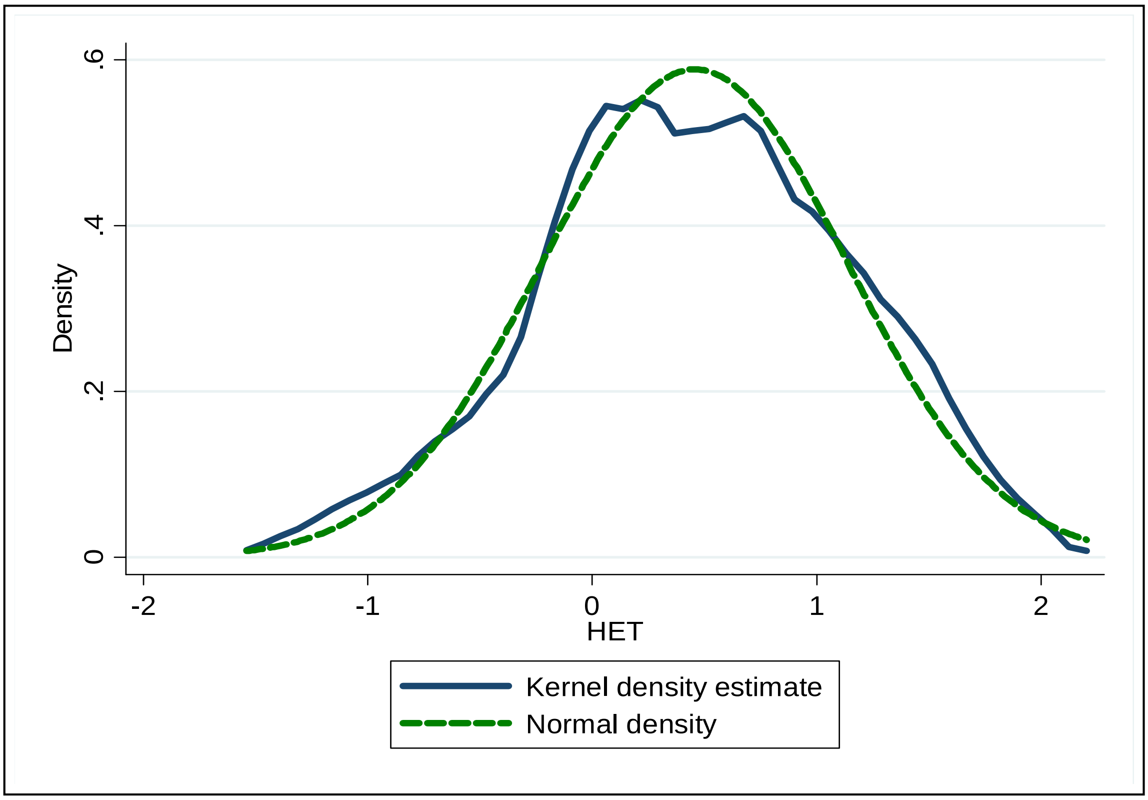

Figure 7-1: Epanechikov-Kernel Density Estimation of HET

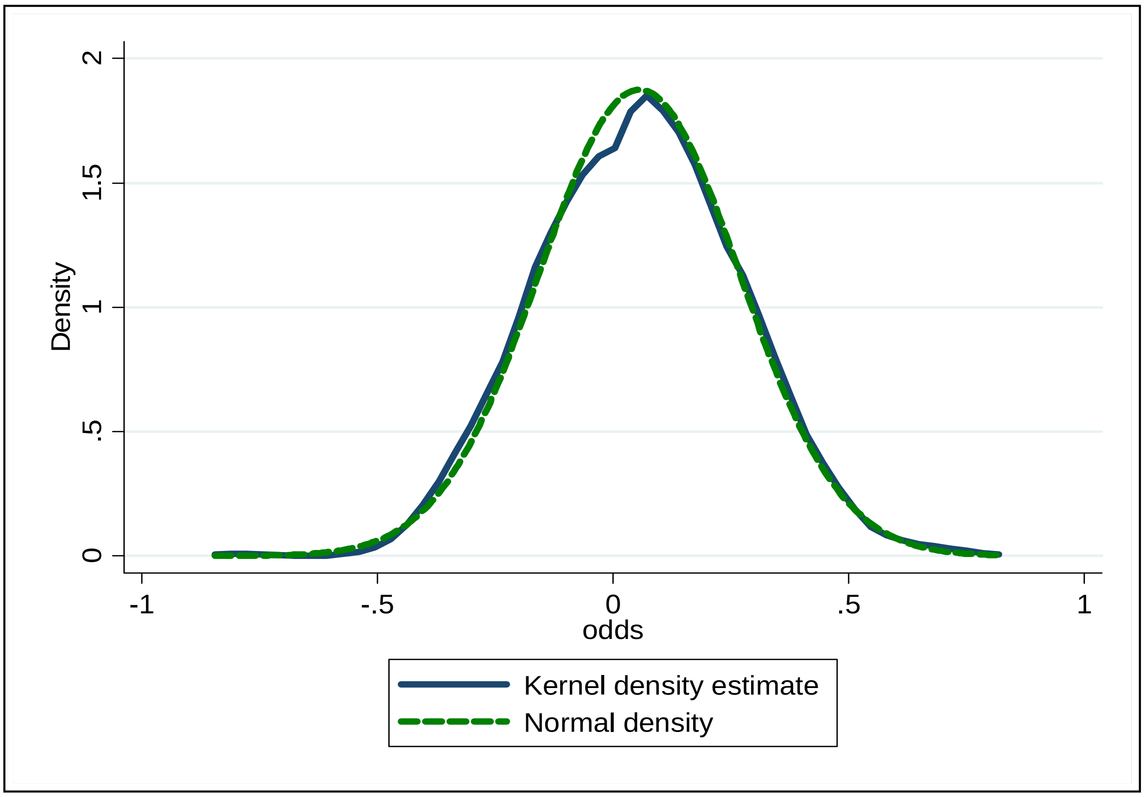

Figure 7-2: Epanechikov-Kernel Density Estimation of log Odds of HET.

The D'Agostino et al. (1990) test (implemented in Stata 10.1 as "sktest") reveals that in the case of HET the distribution deviates from normality. However, presence of normality is indicated by a rather small kurtosis and an insignificant value of the D'Agostiono et al. (1990) test in the case of log odds of HET.

8 The Economics of the World Cup

8.1 Introduction

The FIFA World Cup is an international soccer tournament played every four years in a different country to the previous location. FIFA stands for *Fédération Internationale de Football Association*, and is the governing body of world soccer. In addition to holding the rights to host the World Cup, and owning the World Cup brand, FIFA is responsible for the rules of soccer, as played at both professional and amateur levels worldwide. The World Cup is competed by teams representing countries, more specifically national soccer associations that are officially recognized by the organizers. The first World Cup was in 1930 and the tournament has been held every four years since, with breaks for wartime disruption in 1942 and 1946. Although the specific format of the Finals has varied, the basic concept remains that a large number of national teams compete in a qualifying tournament organized around regional football associations, for the right to participate in the World Cup Finals. In 2010, 32 teams were awarded places in the Finals, played in South Africa between June 11 and July 11 2010. One place is traditionally reserved for the host nation (two places if there are co-hosts as in the case of Japan and South Korea in 2002). The 2010 Finals comprised a round-robin league competition of eight divisions of four teams each, with places allocated by complex seeding principles; this was followed by a knock-out tournament involving single games, leading eventually to the Final. The World Cup Final is the planet's most-viewed sports event. The 2006 Final in Germany played between Italy and France, drew an estimated 75 million television viewers. FIFA estimated that an overall total of $3.4 billion would be generated from proceeds of the most recent World Cup Finals (www.sportcal.com). This would represent an increase from $2.6 billion in the 2006 World Cup held in Germany (Maennig and du Plessis, 2007).

This Chapter will present a general review of the economics of the FIFA World Cup. We shall proceed as follows. Section 1 explores the method by which host countries are selected by FIFA for the rights to organize the World Cup finals. Section two explores the benefits to host countries from organizing the World Cup finals. Since the literature consensus that the direct benefits are at best modest we move on to consider intangible benefits to host country residents from the World Cup finals. In Section three we consider the later benefits to soccer fans in a host country from new stadium infrastructure and other legacies of hosting the World Cup finals. Section four turns our attention to the players participating in the World Cup finals, examining their direct remuneration from participation plus later benefits in terms of career advantages. This Section will present new evidence from the German Bundesliga of salary premia to players associated with World Cup participation. In Section 5, we offer some views on attempts by some national soccer associations to restrict imports of foreign players, sometimes with the explicit goal of using import controls as a means of promoting national success in tournaments such as the World Cup.

8.2 Selection of Host Countries for the World Cup Finals

FIFA is essentially an umbrella organization, comprising six confederations which in turn represent national associations. The six confederations are Africa (CAF), Asia (AFC), Europe (UEFA), North America, Central America and the Caribbean (CONCACAF), Oceania (OFC) and South America (CONMEBOL). Places for the World Cup Finals are allocated by confederations so, for example, UEFA sent nine teams to the 2010 Finals. On the executive committee, UEFA has the largest representation with nine seats out of 24, followed by CONMEBOL, AFC and CAF with four each.

The choice of host country for the World Cup Finals is made by the FIFA Executive Committee from a set of national association bids. In several respects, the choice mechanism has some similarities with that of host city for the Olympic Games, also held every four years, but not in the same year as the World Cup Finals. Hosting the World Cup Finals is a right that the local soccer federation buys off FIFA. Similar to the Olympic Games, FIFA sets up an auction for the rights to hold the World Cup Finals every four years. Also similar to the Olympic Games, FIFA extracts economic rent due to its position as monopoly provider of the tournament. FIFA does not take a fee from the successful bidder but instead insists on a number of favorable contract provisions which can be judged to be components of economic rent. For example, Maennig and du Plessis (2007) report that FIFA insisted that, for the 2010 Finals in South Africa, advertising billboards within 1 kilometer of stadia where Finals games were played, and along access roads to such stadia, should be restricted to FIFA-endorsed enterprises. Profits from such advertising went to FIFA. A similar rule applied to the 2006 Finals in Germany. From 1958 to 2006, FIFA followed a rotation policy, although this was only ever explicit from 2000. Under this policy, the Finals would be held every eight years in Europe, alternating with a venue from another continent (see Table 8-1). Ostensibly, this policy was designed to promote soccer in continents and countries where soccer leagues and soccer participation were less well-established. The choice of South Korea and Japan as co-hosts in 2002 could be rationalized in this way.

Year	Host	Winner
1930	Uruguay	Uruguay
1934	Italy	Italy
1938	France	Italy
1950	Brazil	Uruguay
1954	Switzerland	West Germany
1958	Sweden	Brazil
1962	Chile	Brazil
1966	England	England
1970	Mexico	Brazil
1974	West Germany	West Germany
1978	Argentina	Argentina
1982	Spain	Italy
1986	Mexico	Argentina
1990	Italy	Germany
1994	USA	Brazil
1998	France	France
2002	South Korea/Japan	Brazil
2006	Germany	Italy
2010	South Africa	
2014	Brazil	

Table 8-1: Hosts and Winners of the World Cup Finals since Origin

A counter-argument to the rotation policy is that FIFA has taken the World Cup Finals to countries where soccer is always likely to be a minority sport (USA) or where a club league is always going to be small in size and audience interest (South Africa). Conversely, the continent where soccer is most intensely followed as the dominant team sport is of course Europe. So why does FIFA not locate the World Cup Finals in Europe at every opportunity so as to maximize attendances, broadcast audiences and possibly revenues? One answer to this objection is that the stadium audience is much smaller than the global television audience, now enhanced by other media such as cell phones and internet. With a huge global broadcast audience available it may not matter where the games are actually played. It is notable that part of the revenue from sales of the 2010 Finals broadcast rights came from the USA. FIFA negotiated a deal with the English-language networks, ABC and ESPN for a total of $100 million for the two tournaments in 2010 (South Africa) and 2014 (Brazil). This sum was exceeded, however, by the amount of $325 million paid by the Spanish-language network, Univisión, over the same period. The reason for this large fee is the sizeable and growing Hispanic/Latino minority group in the United States, and their passionate interest in soccer.

There may be a deeper reason for FIFA's rotation policy than an ambassadorial function for the Finals. UEFA, itself one of the FIFA confederations, hosts two tournaments, the prestigious club-level UEFA Champions' League contested by the most successful teams across national leagues within Europe, and the European Championship, a national team tournament contested by European national sides every four years and two years apart from the World Cup Finals. Locating the World Cup Finals on every occasion in Europe, would dilute the FIFA brand and would present UEFA with enhanced negotiating power within FIFA. Understandably, therefore, FIFA avoids the option of locating the Finals in Europe on every occasion.

After the 2018 finals, FIFA will operate a new system for allocation of host nation(s). Rotation will be formally abandoned in favor of a new rule whereby the confederations whose associations have hosted the two preceding World Cups are not eligible to bid. However, all the associations from Asia, North and Central America and the Caribbean, Oceania and Europe could bid for the 2018 FIFA World Cup. The reason for this change in policy came about because Brazil emerged as sole (and successful) bidder for the rights to host the 2014 Finals. As shown in the case of the Olympic Games, rights holders gain more rents from a larger number of bids.

Competition between bidders drives up the sums of money committed to stadium and other infrastructure and these sums are an important part of any successful bid. For the 2006 Finals in Germany, many club stadia needed renovation and redevelopment rather than being built as new. The German Organizing Committee spent $1.9 billion over 12 locations with over 60 per cent of this figure coming from clubs and private investors, meaning that the share of public spending on stadia development programs was relatively low. In contrast, the spending on stadia in South Africa was estimated by Maennig and du Plessis (2007) at $1.4 billion over 10 venues, with five new and five renovated stadia. The key difference from the German case was that in South Africa virtually all the financial commitment was made by the Government. Another difference is that South Africa does not have a well-developed and vibrant team-level soccer league, which Germany clearly has.

In addition to stadia and related infrastructure, such as roads and public transport networks, host associations must commit to various other expenses which include security, advertising and cultural programs. Maennig and du Plessis (2007) estimate the profit for the German organizing committee in 2006 to be $206m, aided by near capacity sales of match tickets. This surplus was distributed among the German Soccer Association (DFB), the German Premier League (DFL) and the German Olympic Federation. In contrast, the estimated profit to FIFA from the 2006 Finals was $1.9 billion, although part of this was redistributed to FIFA development programs worldwide.

Despite the substantial costs involved, which extend to non-trivial costs of the bidding process itself, the likelihood of cost overruns and projections of fairly modest net profits to the host organizing committee, there has been no shortage of bids to host the 2018 and 2022 World Cup Finals. FIFA decided to allocate both sets of Finals simultaneously and by deadline of March 2009, had received seven bids for 2018 or 2022, featuring Australia, Belgium and Netherlands as co-hosts, England, Japan, Russia, Spain and

Portugal as co-hosts and USA. A further four bids were received for 2022 only, including Indonesia, South Korea and Qatar. As at November 2009, the betting odds offered by Sky Bet for host of the 2018 tournament where 11/8 for England, 3/1 for Spain and Portugal and 7/2 for Australia. However, the short odds on England may be driven by national sentiment and odds do vary in response to news stories, such as internal arguments within the England bid team which moved the odds from 11/10 to 11/8 in November 2009.

Given the high costs of stadium infrastructure, security and advertising and the ability of FIFA to extract economic rents as tournament rights holder, it is worth considering in more detail the likely pecuniary and non-pecuniary benefits from hosting the World Cup Finals. Benefits to host country populations are considered next.

8.3 Benefits to Local and National Economies

The general consensus of the economic benefits from hosting large-scale sports events is that these are both exaggerated in ex ante studies and small ex post (Baade, 2003; Matheson, 2008). This consensus covers the Olympic Games (Baade and Matheson, 2002; Hotchkiss *et al.* 2003; Humphreys and Zimbalist, 2008) and the National Football League's Superbowl (Baade and Matheson, 2006). Ex ante estimates of expected economic benefits of large-scale sporting events tend to be optimistic, partly through booster studies undertaken by consultants who have an incentive to report large benefits. The events themselves are subject to a number of leakages and diversion effects. For example, hotel room rates rise around locations of large sporting events. Local residents may leave the area to avoid congestion and nuisance associated with the event. Projected employment gains may be misleading as the jobs involved may well be low-skilled and temporary and many services are actually performed by volunteer workers whose activity will not form any part of Gross Domestic Product.

In contrast, ex post studies of the economic benefits to local economies from hosting a large scale sports studies are more downbeat. There are two methods typically used to evaluate economic benefits ex post. The first is applied by Baade and Matheson (2004) to the World Cup Finals hosted by the USA in 1994 and estimates a regression model of income growth with national GDP growth, demographic variables and time trend as control variables. This study compared income growth in the 75 largest population centers (Metropolitan Standard Areas) before and after the World Cup, spanning a period of 1970 to 2000. The main finding was that actual growth in incomes was less than would have been expected prior to the World Cup event. Moreover, 9 out of thirteen host cities suffered lower growth after the World Cup compared to before. Using a similar approach, Hagn and Maennig (2008) could not find any evidence of statistically significant positive benefits to German regions (in the old Federal Republic) from hosting the 1974 World Cup, whether assessed by GDP growth, income growth or unemployment reductions.

The second approach involves use of local employment data and a difference-in-difference methodology in which employment levels in localities which hosted World Cup games are compared with those that did not host, using differences in employment as the dependent variable in a regression model. This method was applied by Hotchkiss et al (2003) in a study of employment effects of the Atlanta Olympic Games on counties in the Atlanta area. Applying this method to German cities before and after the 2006 World Cup, Feddersen et al (2009) find a lack of significant short-run or long-run employment or unemployment effects attributable to hosting the World Cup in Germany. The procedure was to consider 12 World Cup venues as a treatment group in amongst the 118 largest population urban districts in Germany. Noting that construction projects on host city stadia began several years before the World Cup actually took place, and using a time span of 1995 to 2005, the authors compare differences in outcome measured as per capita income, employment and unemployment levels (separately) before and after the intervention, defined as beginning of a large stadium construction project. The hypotheses of zero income and employment effects of the stadia construction projects in urban districts with completed work could not be rejected at the conventional five per cent significance level.

At the microeconomic level, some particular industries may benefit from a country hosting the World Cup Finals. For example, the German beer industry enjoyed high levels of sales during the 2006 World Cup Finals. But it is difficult to separate the effects of hot weather in the June and July period from the effects of the World Cup Finals. Also, Hagn and Maennig (2009) report that hotel occupancy rates actually fell during the World Cup Finals with substantial reductions in Berlin and Munich as host cities. Revenues held up as room rates rose. These results are very much line with the skeptical analyses offered by Baade (2003) and Matheson (2008).

The absence of substantial direct economic benefits from hosting the World Cup has led several researchers to examine possible intangible or 'feelgood' effects. Heyne, Maennig and Sussmuth (2007) conducted a before-and-after contingent valuation study to extract willingness to pay values for 500 people, before and after the 2006 World Cup Finals in Germany. The authors found that the average ex ante willingness to pay figure for respondents offering a positive value was \$30.4. But fewer than 20 per cent of respondents had a positive willingness to pay so the overall average was \$5.66. After the event, 43 per cent of respondents reported a positive willingness to pay while the over the whole sample before and after the event, willingness to pay had a mean of \$13.4 per person. Many respondents switched from zero willingness to pay to positive willingness to pay, particularly respondents from the eastern Germany and also the less educated. The authors suggest that this is indicative of the World Cup as an experience good and also that ex ante studies of willingness to pay might be biased downwards.

As shown in the 2010 South Africa case, hosting the World Cup Finals can entail considerable spending by the public sector on soccer stadia and associated infrastructure. The case for such spending is stronger if it can be shown that the World Cup generates a net increase in social welfare. But welfare is not observed, and is imperfectly correlated with objective measures such as Gross Domestic Product. This problem has led to use of self-reported happiness indicators in questionnaire studies. The question typically put is "*Taking all things together, how would you say things are these days- would you say that you are happy, quite happy or nor very happy".* Responses are then coded on a Likert scale and applied ordinally in econometric analysis.

Kavetsos and Szymanski (forthcoming) use happiness data taken from the Euro-barometer Survey covering 1,000 people per country over 12 countries for the period 1974-2004. In this case there were four responses to the life satisfaction question: very, fairly, not very and not at all satisfied. The authors propose two hypotheses: i) better than expected national athletic performance raises happiness and ii) hosting major sporting events increases happiness. These hypotheses are tested over the World Cup years 1978, 1982, 1986, 1990 and 1994. Thus, they included a dummy variable for the only host country in the data, Italy, 1990. By comparing national team ratings just before and just after the World Cup Finals the authors tested the impact of team performance on happiness using an ordinal logit model. This model had a long list of control variables. Macroeconomic control variables comprised GDP per capita, unemployment rate and inflation rate. Personal control variables included employment status, sex, age, age squared, marital status, household income quartiles and educational level attained. The results showed that hosting the World Cup Finals by Italy in 1990- who did not win the tournament- was positively and significantly correlated with reported happiness for the population as a whole and for a series of subgroups, with the notable exception of females. The authors also considered anticipation and legacy effects. A set of post-event dummies for two and four years after was jointly significant for all subgroups considered. Also, dummy variables for one year before and one year after gave positive effects on happiness, for the population as whole, for individuals under the age of 50, males, the unemployed and those who had not benefitted from higher education.

8.4 Benefits of Hosting the World Cup Finals to Soccer Fans

A criticism of public expenditure on purpose-built stadia constructed for the World Cup Finals is that they are under-used after the event. In the case of the 2006 Finals in Germany, all 12 stadia used for the Finals reverted to use by Bundesliga clubs after the event. This includes the venue for the Final itself, the Olympiastadion in Berlin, currently occupied by Hertha Berlin. This club is a good example of how a team can successfully raise its attendance following a move into a new stadium. In the season directly after the World Cup Finals, 2006/07, Hertha Berlin’s average league attendance was 25,000. But in 2008/09 average attendance had grown to 52,300 including three sell-out games at a capacity limit of 74, 000.

The German Bundesliga is notable for the enthusiasm of its fans and it is no surprise that several teams which had renovated or new stadia after hosting World Cup Finals have experienced rising league attendances. As put in the baseball literature, the question is ‘if you build it, will they come?’. A thorough empirical investigation of this question is offered, again for Germany, by Feddersen et al. (2006). Their analysis of ‘novelty’ effects of new or renovated stadia follows the literature on baseball attendances (Coates and Humphreys, 2005) and distinguishes three effects:

1. Fans quickly get used to newly built or renovated stadia. This is a short-term immediate novelty effect confined to the first season directly after opening, with a dummy variable set equal to one for this period only.
2. There may be a long-term novelty effect, as long as five years but then ending abruptly. Hence, a dummy variable is set equal to one for time periods t+1 to t+5 after stadium opening.
3. The novelty effect begins on date of stadium opening, has a maximum value after opening but then decays over the following years; the dummy variable is then $D = aT$ where T is a five year time trend and $a<0$.

Looking first at the 1974 Finals, Feddersen et al. (2006) find that there was an average increase in attendance for all clubs playing home games in new or renovated stadia of 47 per cent one season after the Finals. This novelty effect shows some persistence: after five years, eight out of nine new or renovated stadia had higher fan numbers than in the year prior to the completion of construction. For the 2006 Finals, new stadium projects began as early as 1998. For these stadia, the authors find some evidence of novelty effects in the descriptive data. The authors combine impacts of new and renovated for the 1974 and 2006 Finals in an econometric analysis of Bundesliga club attendances over 1963-2003 using club and season fixed effects and controls for regional income and team performance. In Germany, stadium capacity is rarely binding so Tobit estimation is not required. Of the three novelty effects noted above, only the second is significant at the five percent level. This long-term novelty effect is estimated at 2,700 extra fans per game, for five years, or 10.7 per cent on a mean value of 25,000 fans. Higher novelty effects, estimated at an extra 10,300 fans per game, are found for two clubs, Hamburg and Schalke 04, who introduced the innovation (for Germany) of building new stadia without the traditional running track to separate crowd from the pitch.

Feddersen et al point out that a large part of the revenue gains from new or renovated stadia comes from VIP and corporate seats, with around €8 millions accruing to Bundesliga clubs after the 2006 World Cup. It appears that extra revenue from new stadium developments comes from absorbing the purchasing power of a small group of affluent fans, a point that echoes the luxury box strategy of new stadium construction by Major League Baseball and National Football League franchises in North America. Since these affluent fans are willing to pay higher ticket prices then consumer surplus rises, but extra corporate boxes and seating may reduce the capacity available for less affluent fans, leading to 'social exclusion' from games. Supporters' organizations often voice equity concerns as a result.

FIFA operates two key restrictions on stadium development for World Cup Finals. First, there must be a minimum capacity of 40,000. The capacity minimum is designed to ensure sufficient revenue from ticket sales but has the consequence that smaller teams using a World Cup stadium for regular League games may find they often have empty seats. This is a particular problem for countries such as South Korea and South Africa whose Leagues are less mature than European Leagues. In the case of South Africa, two new stadia were built in Durban and Cape Town, holding 70,000 and 68,000 fans respectively. The two stadia in Johannesburg were renovated to reach capacities of 94,700 (Soccer City) and 65,000 (Ellis Park). These are most unlikely to sell out save for a few international rugby and possibly soccer matches and certainly not for club fixtures. Second, FIFA prohibits the sponsorship of stadia in the form of naming rights unless the stadium sponsors are also official sponsors. Thus, the AOL Arena in Hamburg became the FIFA Football World Cup Arena for the duration of the 2006 Finals.

A total of seven out of 12 German stadia were affected in this way. This is another example of rent extraction by FIFA.

Regardless of newness of stadia, hosting the World Cup Finals may lead to a boost to soccer attendances at League level. In his analysis of English Football League, Bird (1982) used a World Cup dummy to capture the combined effects of England hosting and winning the tournament on annual League attendances after the 1966 Finals. Controlling for admission prices, travel costs and real incomes, Bird found that the World Cup contributed to a significant upward shift of 9.7 per cent in the 1966-67 season immediately following the Finals. This was in the context of long-term decline in soccer attendances in England over the period 1946 to 1985. However, Bird could not differentiate between a World Cup effect and a possible uplift to attendances due to the extra publicity brought about by the introduction, for the first time, of a popular TV show *Match of the Day* featuring edited highlights of Saturday matches.

In 1998, France repeated England's achievement of hosting and winning the World Cup. Falter et al. (2008) argue that the period after France's success was one of 'overwhelming joy' which led to a positive network externality on club attendances in the French League. In terms of raw data, average League attendances rose from 16,600 in the 1997/98 season just before the Finals to 19,800 in 1998/99, just after, and again to 22,300 in 1999/2000. Falter et al present an econometric demand model containing a host city dummy, home and away standings, home team payroll as a proxy for team quality, last score of the home team, transport costs, and dummies for seasons, matches involving local rivalry and sunshine all as control variables alongside year dummies intended to capture World Cup effects. Unlike Bird's (1982) study, Falter et al use match level data. Their World Cup dummy variables show statistically significant increases in club League attendances of 14 per cent and 23 per cent for the two years following France's World Cup success, ceteris paribus. There is also a positive and significant host city effect. That is, the World Cup effect on club attendances is stronger for cities that hosted tournament games. This is apparently a combination of new stadium (novelty) and advertising effects.

The authors make two robustness checks that do not affect their results. They deduct the more habitual season ticket holds from their match attendance figures and they also adopt tobit estimation to deal with sell-out fixtures. The authors also note that the rise in attendances in the French League was not matched by other Leagues such as England, Germany, Italy and Netherlands. But the rise in League attendances following a World Cup victory is also apparent in England (1966), Germany (1974, 1990) and Italy (1982). Hence, the authors conclude that average club League attendance tends to increase after a World Cup win and moreover, this effect persists for several years after the victory.

8.5 Benefits to Players from Participating in the World Cup Finals

Players, who appear in national team squads in the World Cup Finals, and in the earlier qualifying tournament, are selected by national associations, primarily by the national team head coach. These players will have employment contracts with clubs, with whom they play their regular soccer games in Leagues, domestic Cup competitions and in other competitions such as the UEFA Champions' League. But national associations have the right to demand release of players from club duties for national selections. This right does not amount to conscription as players can 'retire' from international soccer. Also, players may be injured with their club teams and hence temporarily unavailable for selection for national teams. Clubs receive some compensation for release of players for national team games but this is nevertheless a source of complaint, especially when players return from national games with injuries. Conversely, national associations complain that players withdraw from less important national team games, especially ad hoc 'friendly' matches, with injuries that are not as serious as first appears. The international fixture calendar, including the World Cup Qualifying competition, is carefully set so that club fixtures are removed from weekends or midweek periods when international games are played. Also, the Finals themselves are always played in the close season for the vast majority of Leagues.

In terms of career prestige playing in, and better still, winning the World Cup Finals offers a huge boost to player career incomes and also offers a high non-pecuniary reward. A player who appears in the winning team in the World Cup Finals can expect both national adulation for a long time to come and immense off-field earnings prospects in the form of endorsements and lucrative after-dinner speaking engagements. Hence, players typically regard the possibility of playing in the World Cup Finals as an important career goal. The size of direct payments to players from participating in the World Cup Finals has been assessed by Coupé (2007). He finds for the 2006 World Cup that most national associations had bonus schemes that rewarded performance but incentives did not rise monotonically as the tournament progressed. Table 8-2 shows the total and marginal (by tournament stage) team bonus in millions of Euros paid to competitors in the 2006 Finals (Source: Coupé (2007)). Prior to 2006, FIFA and the national associations had used a fixed bonus per match regardless of the stage of the tournament, presumably under the assumption that prestige effects dominated pecuniary considerations in terms of player effort and performance.

Round	**Bonuses**	**Marginal bonus**
Elimination round	3.79	
Reach 8th finals	5.38	1.59
Reach quarter final	7.28	1.90
Semi final	13.61	6.33
Final	14.24	0.63
Winner	15.51	1.27

Table 8-2: Team Bonuses at the 2006 World Cup Finals

Across the competitors in the 2006 Finals, Coupé finds that different bonus schemes were used. Croatia distributed a fixed percentage of FIFA prize money. Germany operated a fixed increase in prize for reaching the next stage together with a double bonus for winning the Final. Spain applied a rising bonus level at each stage and this was the method closest in spirit to the predictions of tournament theory. Generally though, Coupé finds that bonuses did not have the convex structure that tournament theory would predict. There was no discernable relationship between size or structure of bonuses and either match results or quality ratings of games played. Typically, all players in a Finals squad (fixed at 22 by FIFA) got the same bonus regardless of playing time.

There are several episodes of disputes between players and national associations over the size of bonuses e.g. Germany in 2002 and Ghana in 2006. In Ghana's case, player pressure forced their national association to raise the level of bonuses. Bonuses can vary according to performance in previous World Cup Finals. The bonus paid to the French national team squad was €244,000 in 1998 when they won, rose to €300,000 in 2002, as a reflection of player bargaining power, and fell back after a poor 2002 Finals to €240,000 in 2006 (all values are nominal).

At individual level, a number of studies have shown that soccer player basic salary offered by clubs (before bonuses) can be successfully modeled as a Mincer-type earnings function in which experience (or age) and its square and performance assessed as goals scored and possibly assists to goals are regressors that deliver statistically significant coefficients (Lucifora and Simmons, 2003; Frick, 2006). But these models lack a full set of performance indicators for defenders and midfield players. Lucifora and Simmons (2003) had a sample of 533 players in the 1993-94 season for Italy's Series A and B with salary data gleaned from the players' association. Using dummy variables to denote players who had recently appeared for their national teams, they find that Italian international players received a 52 per cent salary premium against non-internationals while other internationals obtained a higher premium of 75 per cent. The study predates the Bosman ruling of 1995 which led to enhanced player mobility within the European Union. Using a suitable proxy measure of player salaries and with data spanning 1995 to 2005, therefore after the Bosman ruling, Frick (2006) shows, again using a standard Mincer earnings function, that sizeable nationality premia for country of birth applied in the German Bundesliga over the period 1995-2003. On top of these ethnicity premia are further salary returns for each career international appearance made. Frick enters the career international appearance variable in quadratic form and finds that salary is maximized at 50 appearances.

Both Lucifora and Simmons (2003) and Frick (2006) find large salary premia accruing to players who represent their national teams. We suspect that much of these sizeable premia is a consequence of omitted variable bias since the only performance measure in Frick's study is goals scored, itself mostly a product of forwards, while Lucifora and

Simmons consider goals and assists. Future data sets may well resolve this omitted variable problem as more detailed performance statistics become publicly available, including those for defenders. However, we do have detailed data on player performances in the Bundesliga top division for one season. These data include the number of tackles won or lost and both completed and incomplete passes made, plus several other performance measures. We find that the impact of these additional variables on player salary is statistically not significant, separately or jointly considered.

Neither Lucifora nor Simmons or Frick attempt to separate international status or appearances into participation in World Cup Finals and other World Cup games. Clearly, ad hoc 'friendly' matches and World Cup Finals are quite different in prestige and are likely to have different impacts on salary. At least, this is a proposition to be tested. Within the soccer industry, there has been much discussion of the World Cup Finals as a 'shop window' effect for players, especially less well-known players from third world countries. Rather than view misleading video clips or make expensive scouting trips to remote countries, clubs and their agents can view and assess players in the highest-level competition on a world stage.

At issue here is whether participation in the World Cup Finals adds to a players' productivity at club level, that is, augments his human capital, or whether participation in the Finals is a simply a signal. In the labor and education economics literatures, there is a long-standing debate over whether college education adds to human capital or is a signal to employers. In the sports economics literature, we know of no attempt to distinguish signaling from human capital explanations of player salary. In the major North American sports, appearances for a national team are rare. Playing for the USA national basketball team at the Olympic Games is a notable exception. Therefore, international soccer offers an excellent opportunity to discriminate empirically between human capital and signaling explanations of player salary. Arguments can be made for the conjecture that participation in World Cup Finals augment a player's productivity at club level. At the Finals, players must pit their wits against the best players from opposing national teams and their experience of competition at this highest level could well spill over into more successful League performance. Learning effects may also result from playing with excellent peers in one's own national team. Moreover, the World Cup Finals put great pressure on players due to the burden of expectations placed upon national teams by citizens and media alike. The experience of playing under such intense pressure could also aid the mental development of a player.

On the other hand, the World Cup Finals could be argued to be a unique exercise in competition between nations that is unlikely to be replicated at League level, where teams play each other repeatedly, save for entry and exit occasioned by promotion and relegation. It is quite possible that participation in the World Cup Finals adds little or nothing to a player's productivity at club level, yet has the effect of raising a player's salary. This would be consistent with the signaling hypothesis. Indeed, Szymanski and Kuper (2009), in their entertaining account of world soccer, argue that clubs tend to overpay for players who have recently appeared in World Cup Finals.

To properly discriminate between human capital and signaling explanations of soccer player salary one would require more detailed performance measures than current publicly available data sources permit. As an interim step, we can simply assess whether salary premia for World Cup appearances are larger than for other appearances.

We have data on salaries for all players with positive appearances in the German Bundesliga top division from 1995/06 to 2007/08. The salary measure is a market value measure collected by Kicker magazine that is known to be a good proxy (in the sense of well correlated) with a subsample of actual salaries released by the German Football Association (Frick, 2006; Torgler and Schmidt, 2007). This sample comprises 1,993 players for a total number of 6,147 observations. We regress log salary against the following control variables: age and its square, number of appearances in the Bundesliga in the previous season, goals scored last season in the Bundesliga, career appearances in Bundesliga and its square, career goals scored in the Bundesliga and its square and dummy variables for position played in the club team, seasons and region of birth. Over and above these controls we add our focus variables which are number of World Cup Finals games played in the previous season, number of non-World Cup Finals games played in the previous season, career World Cup Finals appearances up to the previous season and career non-World Cup appearances up to the previous season. Non-World Cup games include World Cup qualifying matches, European Championship qualifying and Finals games and friendly matches. Table 8-3 shows OLS and fixed effects (for players) results of our focus variable log salary.

Focus variable	OLS coefficient (t statistic)	Fixed effects coefficient (t statistic)
World Cup appearances	0.087 (6.16)	0.072 (5.58)
Other international appearances	0.033 (9.52)	0.015 (4.02)
Career World Cup appearances	0.029 (2.70)	0.004 (0.20)
Career other international appearances	0.007 (4.33)	-0.005 (1.32)
Career other international appearances squared	-0.0001 (4.02)	0.000 (1.05)

Table 8-3: OLS and Fixed Effects Results for the German Bundesliga

The results clearly show that one extra appearance in World Cup Finals games delivers a greater salary benefit compared to one extra appearance in other international games. This result applies to both ordinary least squares and fixed effects estimates, although the latter may not be reliable due to the small of number of observations per player (three on average). Also, an extra career appearance in World Cup Finals games up to the previous season delivers a greater salary increment than an extra game played in non-World Cup Finals matches. Hence, we have support for a World Cup shop window effect on player salaries.

The ordinary least squares results show impacts of international appearances at the means of variables. But the salary distribution for soccer players is highly skewed, even more so than in standard occupations. Evaluating impacts at the mean may then be misleading and it is useful to consider impacts over the whole salary distribution. Recently, a number of studies have looked at determinants of player salaries in various sports using quantile regression (for example, see Berri and Simmons, 2009 on National Football League quarterbacks and Vincent and Eastman, 2009 on the National Hockey League). This method allows us to estimate differing salary impacts of covariates through the salary distribution. Our own quantile regression results for soccer player in the Bundesliga are shown in Table 8-4.

Focus variable	0.1 quantile	0.25 quantile	0.5 quantile	0.75 quantile	0.9 quantile
World Cup appearances	0.107***	0.102***	0.079***	0.069***	0.062**
Other international appearances	0.029***	0.022***	0.031***	0.037***	0.044***
Career World Cup appearances	0.029*	0.039**	0.030**	0.039**	0.035**
Career other international appearances	0.004+	0.005**	0.007***	0.008***	0.009***
Career other international appearances squared	0.000+	-0.0001**	-0.0001***	-0.0001***	-0.0001***

***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 level, + denotes insignificance (z-values in brackets).

Table 8-4: Quantile Regression Results for log Salary

The results of the quantile regression broadly support those of OLS. At the median salary, it is clear that salary returns to an extra World Cup Finals match exceed returns to other international matches. However, above the median the gap in returns is not significantly different at five per cent level, despite the apparent gap in point estimates. The results point to diminishing returns of salary to recent World Cup Finals appearances through the salary distribution. For career appearances, the results are more clear-cut with salary returns to career World Cup Finals games being always greater than returns to other international games, at all quantiles.

At club level it is apparent that some national Leagues are more prestigious and generate more revenues than others. Hence, one would expect the best players to gravitate towards those Leagues where these players' marginal revenue product would be at their highest. The Leagues where revenues and average player salaries are highest at present are the English Premier League and Spain's La Liga. UEFA gives each European team a score, based on standings in national Leagues and progress in European competitions, essentially the UEFA Champions' League and the European Cup (previously UEFA).

The score variable ranges from one to 31. We create a variable, mover, which states if players switch from lower ranked teams to higher ranked teams or the other way around. Positive numbers suggest a change to a higher ranked team. We then estimate a probit regression for this variable using the same control variables as for the salary model above. This model is estimated for all players who switch teams within Europe, giving us 1,638 observations. Using our World Cup dummy variables already created, we can determine whether participation in World Cup games raises the probability of movement to a more highly ranked team. The estimated coefficients from our probit model are shown in Table 8-5 below.

Focus variable	coefficient (t statistic)
World Cup appearances	0.335 (3.00)
Other international appearances	0.026 (1.57)
Career World Cup appearances	0.045 (0.81)
Career other international appearances	0.026 (2.92)
Career other international appearances squared	-0.0004 (3.38)

Table 8-5: Probit Estimates of Movement to a more Highly-Ranked Team

It is clear that an extra recent appearance in a World Cup Finals match raises the probability of a move to a more highly ranked team, conditional on moving at all. In contrast, an extra recent appearance in other internationals has no statistically significant effect on a move to a better team. Looking at the career variables, however, the results switch so that an extra career World Cup Finals appearance has no effect on probability of a move to a more highly ranked team while an extra career appearance in other international matches does have a significant and positive effect on transition to a better team. Nevertheless, the marginal effect is smaller than for recent appearances in World Cup Finals matches.

To summarize, recent appearances in World Cup Finals matches do appear to have shop window effects, both by raising player salaries paid by clubs and by helping players secure transitions to more highly ranked teams. This still leaves open the intriguing research question as to whether participation in World Cup Finals matches genuinely raises player productivity or whether it is just a signal that need not necessarily represent player ability.

8.6 Club versus Country?: The Domestic Player Quota Debate

Up to the Bosman ruling of 1995, it was possible to restrict the number of foreign-born players in a national League by means of various rules. In the English Football League in the 1950s and 1960s, 'foreigner' meant a player from Scotland or Wales and not someone from Africa or South America. Many European Leagues, such as England and Italy, operated a rule such that a club team could consist of a maximum of three foreign-born players plus two 'assimilated' players who were foreign-born but had played at club level in their adopted country for at least two years.

After the Bosman ruling, such restrictions were deemed to be counter to principle of free movement of labor, at least as far as European Union countries were concerned. Restrictions remained in place for players attempting to move into European Union Leagues from outside the European Union. But the increasing demands by clubs for quality players from outside the European Union grew, and restrictions became more relaxed over time. We now have a situation where each major soccer League in Europe (England, France, Germany, Italy and Spain) has a cosmopolitan mix of players from all continents. Indeed, it is quite possible for a team to field a starting eleven consisting entirely of non-domestic players, as practiced in recent years by Arsenal and Chelsea in the English Premier League.

Increased immigration of player talent has led to concerns that the displacement of domestic talent by foreign-born talent, a form of import substitution, might undermine the prospects for the national team. In England, these concerns were documented in a set of proceedings from the 'feet drain' conference held at Birkbeck College, London in April 2008. These proceedings feature an address by Gordon Taylor, Chief Executive of the Professional Footballers' Association which summarizes the arguments in favor of quotas of domestic nationals in team squads, using the term 'meltdown' to describe the internationalization of playing talent in the English Premier League in particular

(Taylor, 2009). Recently, UEFA has implemented a ruling whereby the squads of teams playing in its Champions' League football competition should comprise 25 players, 8 of which should be 'home grown', meaning having trained for three seasons at a domestic club between the ages of 15 and 21, and of these at least half should have been trained at the club itself for the same period. Similar rules will be applied by the English Premier League from the 2010/11 season. One of the arguments in favor of such quotas is that they encourage the development of promising young 'home grown' players who may eventually be selected for their national teams. Conversely, the present arrangements in several European Leagues, where starting teams in England, in particular, feature relatively few English players and youth academies also feature a high proportion of 'imported' foreign players, are alleged to stifle the development of the national team. In England, this translates into the notion of reduced prospects of winning the World Cup.

Looking at the general arguments surrounding fixed quotas for playing rosters at club level, we make several predictions drawing on simple economic theory:

- The supply curve for talent gets steeper as there is more competition for stars, giving richer clubs an advantage;
- There will be rising salaries for domestic stars;
- There will be less competition for international players means owners get more profits;
- Playing quality falls as some stars leave for Leagues that do not operate restrictions;
- Broadcasting deals become less attractive as the total pool of talent is less;
- Big clubs will be less able to win the UEFA Champions' League;
- Small countries will be less successful in national competitions such as the World Cup.

In a literature that is analogous to that on Olympic medal success, a number of papers have empirically modeled World Cup success using World Cup Finals rankings or something similar as a dependent variable in a regression analysis. Monks and Husch (2009) present a panel data analysis of World Cup success, over 1982 to 2006, using tournament Finals standings as their dependent variable. They find that playing on one's own continent and being seeded are each significant determinants of World Cup success. In purely practical terms, of course, the strong records of Brazil and Germany (previously West Germany) at the World Cup Finals, as noted in Table 8-1, means that a national team aspiring to win the tournament has to be capable of beating one or both of these teams, or hope that some other team does so.

Leeds and Leeds (2009) adopt a cross-country (not panel) analysis with FIFA points assessed at 2006 as their dependent variable. They find a statistically significant positive effect of the international success of a country's *club* teams on *national* team success. A specific example supporting this result is France in 1998, who managed to win the World Cup with a majority of players in the national team being attached to clubs outside France, many of which had made successful progress in the Champions' League. As we showed earlier, in section three on impacts of World Cup Finals on fans, Falter et al (2008) report positive externalities from French national team success on club attendances and revenues. Szymanski and Kuper (2009) take the club versus country arguments a stage further by suggesting that England's prospects for World Cup success would be enhanced if more of the higher-quality English players actually played abroad, a suggestion that is directly counter to the arguments noted above in favor of domestic quotas. However, Szymanski and Kuper also suggest that the natural Finals standing for an England team at the World Cup is the quarter-finals stage and it is somewhat optimistic, based on historical data, to expect anything better.

Overall, the attempt to re-introduce domestic quotas in European League soccer appears to be a protectionist device with little merit. The case for such quotas to actually contribute to enhanced World Cup performance has yet to be made, and does not come with any supporting empirical observation. It is notable that the 'internationalization' of teams in European soccer Leagues has been accompanied by rising attendances in four out of five major European Leagues since the mid 1990s (Italy being the exception, which can be explained by a host of specific circumstances relating to hooliganism and corruption scandals). Thus fans, and also television viewers, appear to like the increasingly cosmopolitan make-up of their club sides.

8.7 Conclusions

The FIFA World Cup can make a legitimate claim to be the world's largest sporting tournament, even bigger than the Olympic Games in terms of broadcast audience and worldwide interest. The rights to hold this lucrative and prestigious tournament reside with FIFA and it is no surprise to find that FIFA succeeds in rent extraction, even though FIFA does not take a direct payment from local organizing committees. FIFA does earn substantial revenues from sponsors and advertisers and employs restrictions to ensure that official FIFA partners receive favorable treatment on access to advertising space e.g. on billboards.

The consensus of the sports economics literature is that the World Cup, in common with other large-scale sports events, does not generate substantial benefits in terms of local real income and employment growth and unemployment reductions. In contrast, non-pecuniary benefits, in terms of enhanced satisfaction and happiness, have been identified by some recent research. Further research is needed to corroborate these findings. There is little doubt that hosting the World Cup Finals is costly in terms of stadium development, infrastructure and security. Where public spending is involved in hosting the Finals, more cost-benefit studies on the net benefits to the host country would be welcome.

There are two impacts on soccer fans worth noting. First, there are novelty effects of new stadia that persist for some time after new stadia are constructed, at least as far as Germany 2006 was concerned. Second, hosting and winning the World Cup can lead to a boost to club attendances through a 'warm glow' effect.

Players who appear in the World Cup Finals appear to benefit in terms of enhanced salary, although whether this is due to a signaling effect or to genuine improvement in productivity is a matter for future research to resolve. Finals participants also benefit from increased probability of a transfer to a better club, as measured by UEFA rankings for European clubs.

The FIFA World Cup Finals is no doubt here to stay as a vital component of the sporting calendar. Avoiding excessive and wasteful expenditures is difficult to achieve, given the emotion and sentiment that surrounds the event. But the World Cup does offer excellent opportunities for economists to make substantial contributions to the various public choice and policy issues surrounding the World Cup, including a more sober assessment of employment and income effects that is present in consultancy and booster studies.

9 Outlook

To address the main question stated in the introduction, the present work analyzes the influence of personality traits on individuals' income. As I relate leadership ability to the personality trait "extraversion", I find clear support for the claim that leadership ability is indeed rewarded monetarily. Research for the German Bundesliga as well as the National Hockey League reveals that team captains in professional sports receive a considerable wage premium. Controlling for individual player characteristics and performance indicators it shows that team captains in soccer earn a wage premium between 25 and 67 percent, while team captains in hockey receive a wage premium between 21 and 35 percent. To evaluate these results, comparable research concerning other sports, possibly with different team sizes and varied numbers of team captains, would be of great interest. Theory of organization would lead us to the expectations of rising benefits of leadership ability as team size increases and as the number of team captain decreases.

The following two chapters address the influence of pressure on individuals' performance. Relating to the personality trait of emotional stability, we show that professional basketball players who are able to maintain their performance level during pressure situations are rewarded monetarily. Furthermore, I present an empirical work about the effect of performing in front of friendly and hostile audiences, focusing on the effect of changing teams and therefore supportive audiences between two seasons. Research shows that players' performance suffers during home games after they sign with a new team as they feel additional social pressure. This is most notably true for players who display comparably bad performances. Consentaneously, both studies show that emotional stability does not increase with age and therefore appears to be innate. This finding clearly goes in line with the literature presented in the introduction which states that personality traits rather not change over time. Future research might combine both studies to analyze the influence of supportive or hostile audiences on performance during pressure situations.

For my research on the relative age effect in the German Bundesliga, I summarize results as follows: Grouping children according to their age leads to labeling older children of the cohort as being more talented which leads to more support during their early playing years. My data set on professional soccer supports the claim that this selection improves the probability of the oldest members of the cohort to become professional soccer players in the Bundesliga. Along with my thesis that the birth date itself should not affect playing performance, I find no proof for a monetary reward of reaching the professional level despite an age disadvantage. Providing hazard rates this statement is supported as the length of stay in the Bundesliga proves to be independent of the date of birth. A similar research for the German second division would provide the possibility to compare career tracks dependent on the date of birth.

Concerning the sabotage behavior of heterogeneous contestants, our theoretical model and empirical work offer concurrent results. Our formal model suggests that the favorite in a tournament chooses legal activities, while the underdog is tempted to engage in illegal activities. The reasoning is that the favorite is more productive with respect to legal activities and that both types of activities are substitutes. In our empirical section, we demonstrate the plausibility of the theoretical model by using match-level data from the German Bundesliga. We find that teams that are more likely to win a match, win significantly more tackles in a fair way while they commit significantly fewer fouls. As betting odds, which enable us to compute the implicit winning percentages, are available for many other professional team sports a similar research for another league would be of great interest.

Summarizing previous research on the economics of the FIFA World Cup we conclude that the FIFA itself earns considerable revenues from sponsors as well as advertisers. For the host country research does not find substantial benefits for the local economy as real income and employment rates are not affected positively. In contrast, players benefit monetarily from participating in the World Cup as our work supports the thesis of a shop window effect. In addition, we show that players from the German Bundesliga who participate in the World Cup exhibit an increased probability of a transfer to a better club, as measured by UEFA rankings for European clubs. Future research might try to find a shop window effect for the European Championship, which we expect to be significantly lower than the shop window effect for the FIFA World Cup.

After providing implications and ideas for future analysis separately, I conclude by presenting an outlook for ulterior research. Data used for research in the present work provides the basis for some yet unanswered questions in the field of sport economics. One work soon to follow concerns nomination contests in professional sports, especially for German soccer players in the German Bundesliga and relates to Spence (1973). Players signal their abilities during games in the Bundesliga to be nominated for international caps. As previously shown, being nominated to the national team has a significantly positive impact on the players' salary. The question arises which performance indicators influence the chances of being nominated to the national team. Preliminary results show that players' age, experience in national and international competition as well as most recent performance in the Bundesliga have a significant impact on the chances of being nominated.

Also to follow soon is a joint work with Arne Büschemann concerning the efficiency of teams in the four major league sports in the United States. We have information concerning the economic performance of all teams such as the value of teams, revenues and operating income. In addition, we have specific information for all teams concerning average attendance, market size, sporting achievements of the team, the fan cost index and the tradition of a club. By performing frontier analysis we are going to test whether teams in bigger markets, which face competition by other teams nearby, exhibit higher efficiencies due to competition. In addition, we would like to reveal if the lockout in the National Hockey League in 2004/05 and the following new collective bargaining agreement led to higher efficiencies of the teams in the National Hockey League.

A third subsequent work will concern violence in professional hockey. It follows a work by Dennis Coates and Andrew Grillo (2009) who relate the influence of fighting, violence and penalties to team and league success in the National Hockey League. In a joint work with Marcel Battré and Dennis Coates we transfer this approach to European professional hockey leagues to test whether the influence of the aforementioned factors are the same. We possess comparable data from the German and the Finish professional hockey league and are able to relate rule changes, which occurred during the observation period, to the impact of violence on aforementioned measurements of team and league success.

To summarize: Even though the present work sheds light on different parts of personal economics there is still a lot of work to be done. Sports data offers the basis to answer aplenty of research questions, waiting to be worked on.

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